Meat Goats

Alberta

Meat Goats

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Alberta Agriculture and Food

Alberta

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Acknowledgement

First Edition

The author would like to acknowledge the help and advice of the livestock management, health and nutrition specialists at Alberta Agriculture and Food, particularly Kim Stanford, Wray Whitmore and Dr. Ray Fenton, as well as the many Western Canadian goat producers for their practical advice.

Second Edition

This second edition features a new cover, new layout and some clarifications and updates. Thanks to Dr. Hernan Ortegon, Alberta Agriculture and Food, and Jackie Dunham, Alberta Goat Breeders Association, for updating the original manuscript.

Introduction

More goat meat is eaten worldwide than any other type of red meat, although relatively little is consumed in North America. People who move to Canada from elsewhere still enjoy consuming goat meat, chevon, as a part of their traditional meals, particularly during festive seasons.

Producers of goat meat who want to supply this growing market should first ensure they can find and supply this market at a reasonable cost. Remember all goats must be slaughtered at licensed and inspected facilities, except those goats used by the farm family.

This book focuses on raising kids specifically for meat production. Kids may be raised either by their dams or by feeding milk replacer to supply the milk-fed kid market or kept with their dams on browse pasture until they are sold as larger meat goats.

The highest prices are usually received for milk fed kids up to 22 kg liveweight that are marketed just before Christmas and Easter. Producers who use goat milk for other purposes often aim to market their kid crop during these periods. The best prices will be received for kids in very good condition weighing around 18 kg.

Many commercial meat goat producers prefer to market larger kids that are under 14 months of age, weighing from 25 to 55 kg, even though the price received per pound may be lower. The advantages include a higher net return per animal, less handling of lactating does and a year-round market.

Before you start a meat goat operation, assess your experience and the availability of facilities, labour, markets and money to determine whether a goat operation can fit into your farm plan. The common causes for a meat goat enterprise failing include marketing problems, mismanagement of animals, improper facilities (especially fencing) and lack of labour or capital.

To be successful, you must enjoy working with goats

A few terms you may encounter:

Buck – a male goat, sometimes called a billy.

Doe – a female goat, sometime called a nanny.

Kid – a young goat, usually under a year old.

Wether – a castrated male.

Chevon – the preferred name in North America for the meat of goats. Other names are sometimes used: cabrito, capra, capretto.

Kidding – the act of a goat giving birth.

Estrus – the fertile period of a doe's reproductive cycle.

Raising Meat Goats

All breeds of goats can be used for meat production. The Boer goat, introduced to Canada in the 1990s, is a breed developed specifically for meat production. Most meat producers are now using Boer genetics, often crossing Boers with dairy, fibre or Spanish goats to obtain superior carcasses. The Spanish goat is also predominantly a meat breed, which can also be used for cashmere production.

Among all breeds, there are individual animals and bloodlines that grow quickly and produce a better than average carcass. A meat goat producer looking for breeding animals should select new does primarily on the basis of kid records, breeding history and good management practices.

The easiest way to raise kids is on their mothers. Most large meat-growing operations depend on does to feed all the kids. It is also possible to foster purchased kids or extra kids on the better milk producing does. Most does will adopt new-born kids, particularly right after they have given birth. A doe that is reluctant to foster a newcomer can be tied or held for the kid to nurse; most does will begin to mother the kid or at least allow it to nurse at will within a few days. In this way, few "orphan" kids will have to be raised by hand.

Small producers often hand-feed a portion of the kid crop and allow other kids to nurse the does that are not being milked. Dairy operations and intensive kid-rearing centres feed kids almost exclusively by hand, and rely on high quality milk replacer or cow milk to reduce the expense of milk feeding.

Hand-feeding of kids has definite advantages for the commercial milk producer, because the amount of valuable milk used by the kids can be regulated or substituted with milk replacer or cow's milk in part or entirely. A home operation may have similar reasons for raising kids by hand, in addition to the fact that does are easier to handle and their health is better monitored with twice-a-day milking. Kids raised by hand grow well if factors such as parasites and sanitation are attended to. There is no denying, however, that dam-raised kids grow faster with less trouble to the operator and have fewer health problems in most situations.

Chevon as a By-product

For a family or a commercial dairy operation, growing kids for meat is an excellent way to use surplus summer milk. Hand-feeding milk to kids from birth ensures the kids leave enough milk for the operator. In some situations it is more convenient to allow the kids to nurse their dams at least part of the time. In this way, the kids can be left with the does, nursing at will, whenever the operators need a short holiday. The does, however, should be introduced to the milking area and familiarized with the milking routine immediately after freshening if you want to keep milking them after the kids have been weaned.

Separating the kids from their dams for part of each day is one way to successfully combine a producer's need for milk and the kids' requirement for milk. With the kids penned securely, the doe can be milked at the time of separation and milked before the kids are returned. While separated from the doe, the kids should have access to high quality feed and fresh water. Kids managed this way usually grow just as well as those kept constantly with their dams.

Although raising kids on the dam is convenient, it makes it more difficult for the operator to monitor the doe's udder health and production. Other concerns are the difficulty of weaning and the spread of diseases from does to kids (e.g., Johne's and caprine arthritis-encephalitis CAE) or of diseases such as soremouth from the kids to the does' udders. Some forms of mastitis, particularly low grade chronic forms, may be spread by kids stealing milk from other does.

When the primary goal is to produce milk, dam-raising of the kids is the least desirable way to raise meat goats. However, if you are most interested in growing healthy, meaty kids in the shortest possible time with the least effort, does will do the best job.

Commercial Meat Goat Production

Estimating Costs

Feed – Much of the profit derived from a meat goat herd is found in the difference between the revenue from goat sales and feeding costs. In Canada, the feeding period (the period off pasture) is considerably longer than it is in parts of the United States, where goats can browse year round.

Pasture is the least expensive feed source for most producers. Goats thrive on brush and bramble that is unsuitable for other classes of livestock. Producers can turn goats out as soon as leaves appear on trees and bushes and leave them there until snow forces the goats in for feeding.

This program fits well with another role of goats – brush clearing. Goats prefer the young leaves and tender stems of brush and small trees over any other kind of food. They eat grass, if that is all there is, but prefer shrub and sapling growth up to two metres tall. If turned out in sufficient numbers, a herd of goats can quickly discourage woody re-growth on cleared land. One community pasture in northeast Alberta has used goats for brush control for several years, replacing expensive mechanical clearing. On a smaller scale, a herd of goats can open up brushy, wooded portions of a farm to sunlight, promoting drying and the growth of grasses. Goats, in combination with cows and sheep, can help make the best use of most Alberta pastures.

Goats in Alberta must be fed from mid-October to mid-May every year, roughly 200 days per year. To estimate feed costs, assume that each mature goat will eat about 2 kg of dry matter per day. Estimates of feed use should account for feed waste, which is highly dependent on feeder design.

Grain is usually required before and during the breeding season for bucks and does alike, and is necessary for does in late pregnancy and early lactation. On average, does that breed once a year need about 100 kg of barley or oats. Kids can be fed mixed grain in a creep feeder; market wethers and doelings can be finished with 250 to 500 g of grain per day during a 60-day feeding period.

Other Expenses – Another significant expense in large herds is preventive health care, which is certainly less costly than the diseases it prevents. Some basic health management expenses are:

- Clostridial and caseous lymphadenitis vaccinations. Each adult requires one booster per year; kids and purchased stock need an initial two doses as well.
- Deworming at least twice a year: at kidding and mid-summer. Use an effective dewormer that is recommended by a veterinarian.
- One kilogram of coccidiostat-medicated salt per kid.
- Louse control.
- Iodine disinfectant for dipping navels and treating wounds.
- Hydrated lime for liming yards, barns and pens after cleaning.
- Bedding for adults – 3/4 lb/hd/day x 210 days, and for feeder stock – 1/4 lb/hd/day x 90 days. Clean, unweathered wheat straw is best; oat straw has very poor absorbency.

All of the above are needed for maintaining the health of a goat herd. Other preventive treatments and vaccinations may be budgeted for if necessary.

Veterinary expenses will depend on the operator's level of expertise. A producer does not have to rely on a veterinarian for routine herd care such as vaccinations or tending to cuts. However, a veterinarian will be needed to help investigate health problems and perform surgical procedures on valuable animals.

In many cases, a producer will find culling a sick animal is less expensive than treating it, and removes a potential source of infection from the herd at the same time.

Keep a basic supply of first aid equipment and medicines handy for emergency treatments. It is unnecessary to keep a great variety of drugs. Consult with a veterinarian about medicine use. Keep syringes and needles and other equipment clean and in good condition. Refrigerate drugs if that is recommended on the label. Do not use medicines and biologicals past the expiry date given on the label.

Tools needed for routine procedures:

- disbudding iron
- castration equipment: elastrator, emasculator or Burdizzo clamp
- hoof trimming shears
- ear tag pliers and small ear tags
- drenching gun
- syringes
- sterile needles
- livestock thermometer
- weigh scale (50 kg capacity)

Responsible Use of Veterinary Drugs

Veterinary drug legislation provides livestock producers access to a variety of veterinary drugs for the prevention and treatment of diseases and for improvement of production. The availability of safe and effective veterinary drugs and the proper veterinary advice has made it possible for the livestock industry to attain high production efficiency. Consumers have benefitted from the abundant supply of wholesome, safe and relatively inexpensive food. It is most important for the livestock industry to retain consumer confidence in food products of animal origin.

Health Canada is responsible for evaluating drugs for use in animals to ensure that:

- veterinary drugs are safe and effective
- meat, milk, eggs, fish and honey do not contain potentially harmful drug residues

They have established tolerances for a number of chemical and biological residues in meat and other food products. Monitoring to ensure these limits are not exceeded is carried out on a systematic basis. Most veterinary drugs in Canada are not offically approved for use in goats. In some cases, drugs must be prescribed by a veterinarian prior to use in goats. If in doubt, consult a veterinarian.

Proper Drug Handling

Everyone who uses drugs on food animals has a responsibility to ensure they are used properly and that their use does not result in drug residues in the human food chain. **Administer drugs according to the labelled directions for use and observe the withdrawal periods.** Studies have shown that the main cause of residues in meat and milk is failure to observe proper withdrawal times. Exceeding the recommended dose, improper mixing of feed additives, lack of animal identification and not recording treatments were other identified contributing causes.

The same studies also found that common over-the-counter injectable drugs were more frequently involved with residues than prescription drugs. The person who administers drugs and makes decisions on the sale of the animals was found to be responsible for the majority of the drug violations.

Storage

Some drugs may be stored at room temperature while others require a cooler temperature, which is indicated on the label. Drugs that require storage at 2 to 6°C should be kept in a refrigerator. Others require storage in a cool place between 8 and 15°C. All drugs should be protected from freezing and excessive heat. Medicated feeds should be stored separately from non-medicated feeds.

Safety of Handler

Everyone who handles veterinary drugs should be aware of the potential risks to themselves and others. Be aware of the potential routes of human exposure – skin absorption, ingestion by mouth, inhalation and by injection. Before using any medication, take time to **read the label** for safety warnings, secondary effects and first aid procedures.

Proper Disposal

Outdated or unwanted drugs should not be thrown into the garbage. They should be incinerated if such facilities are available or, alternatively, contact should be made with the local municipality. Many municipalities have arrangements to collect unwanted pesticides and other hazardous chemicals.

Facilities

Fences

Goats can jump fences, and once they learn how they can be hard to contain. Therefore, fences for even very young kids should be high enough to prevent them from jumping out by accident. As kids grow, they can be moved into pens with higher fences if necessary, or trained to respect electric fencing by placing an electrified strand of wire offset inside the fence at the nose height of the animals.

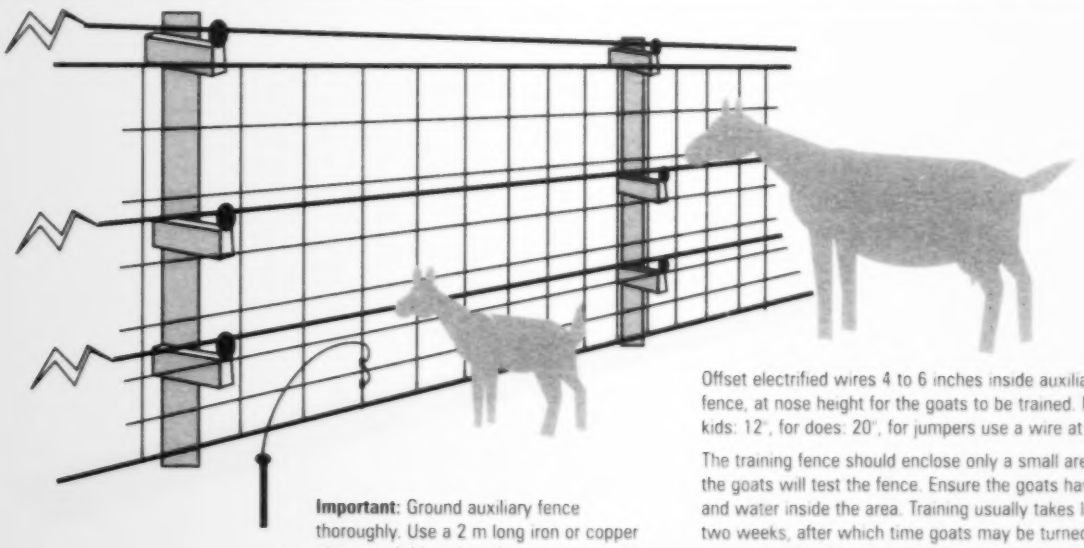
Lactating does are not as likely to jump, but fences for large kids and dry yearlings should be at least 1,200 mm high. Bucks have the strongest motivation for jumping during breeding season, and yearling bucks have the advantage of legginess without a heavy body to hold them down. Breeders report bucks can jump over two metre high fences. If this happens an operator may choose to restrain the buck (tethering, hobbling, etc.) inside the pen until he grows out of the ability or the breeding season passes. Some breeders believe it helps to have a fence that permits the buck to put his head through (head only) to nuzzle and talk to the does on the other side; this seems to keep the buck's attention away from the top of the fence.

Crawling through or under fences is even more attractive to goats. Care must be taken to space boards properly in wooden fences and eliminate any gaps or weak spots in wire fences.

Do not fence goat enclosures with barbed wire. It is ineffective and dangerous.

Electric Fencing

Electric fencing is an effective and relatively inexpensive way to control goats. Detailed instructions for constructing a predator-proof electric fence are available from Alberta Agriculture and Food. Electric fencing is recommended for perimeter and pasture



Important: Ground auxiliary fence thoroughly. Use a 2 m long iron or copper pipe or rod driven into the ground.

Offset electrified wires 4 to 6 inches inside auxiliary fence, at nose height for the goats to be trained. For kids: 12", for does: 20", for jumpers use a wire at the top.

The training fence should enclose only a small area, so the goats will test the fence. Ensure the goats have feed and water inside the area. Training usually takes less than two weeks, after which time goats may be turned onto pasture enclosed by electrified fencing alone.

Electric training fence for goats

fencing. In summer, many breeders use pasture perimeter and divider fences with only one or two strands of electric wire.

Always follow instructions for grounding fence and ground wires. Supplementary wire mesh fence should be grounded properly to increase effectiveness of electric fencing.

Electrified strands can be used with other fencing systems to prevent goats from damaging the barrier fencing by leaning, standing or chewing on it.

Be sure the electrified strand on the inside of the fence is well separated or insulated from other wires, posts or boards. Always use insulators for electrified wires, whether or not the manufacturer says they are needed. To keep wires from grounding, mount insulators on extenders when necessary.

To train goats to respect electric wires, use wire mesh fences with electric strands running at least 7 to 10 cm inside the fence at heights of 30 and 50 cm. Hang bright metal objects (such as folded food tin lids) on electrified strands to attract the goats. Goats are likely to investigate by nibbling on these objects.

Wire mesh prevents a goat from bolting forward and escaping, thus learning to put up with a shock for the greater reward of freedom. Once a goat receives one or two strong shocks without going through the fence, it will avoid electrified wires.

Fencing for Winter Yards

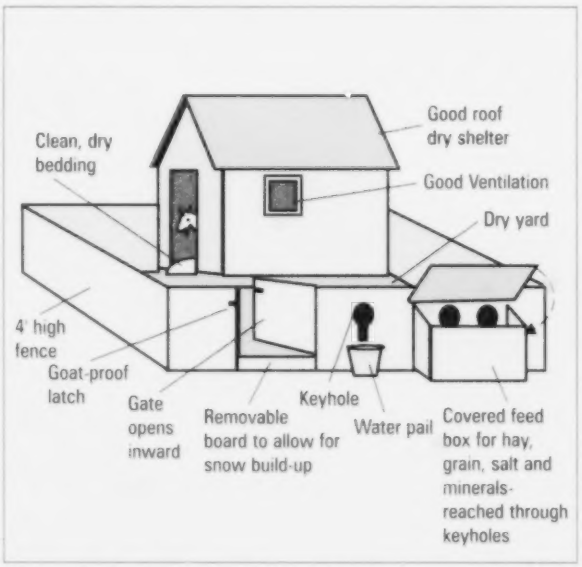
Wire mesh or board fences are safest for winter yards for goats. Board or slab fences may also provide some protection from winter winds. A 1,200 mm high fence is adequate for does, but a fence that is 1,500 mm or higher may be required to keep bucks separated from does that are in heat.

The more pens you have, the lower the stress on the herd from competition for feed and space. Goats can be separated into smaller groups of similar size, feed requirements, or stage of pregnancy or lactation. However, extra pens will make cleanup more difficult. The solution may be to use panels fastened together as required, which can easily be dismantled for cleaning.

If kids are to be enclosed, use plywood for the lower half of the panel, or use stock fence with graduated wire spacing of 10 cm or less.

Housing

Adequate shelter must be provided for goats in all seasons. Barns used for housing meat goats can be simple. Dry does and bucks need a 3 1/2 sided shelter with a good roof for protection from winter storms and precipitation. Goats are much more susceptible to sickness at any temperature when they are damp than when the weather is just cold. If goats are confined, humidity must be kept low and moisture must be prevented from condensing on walls and ceiling. In some cases, passive ventilation systems (opening doors and windows) will be sufficient. In others cases, active ventilation systems including air intake and exhaust fans will be necessary.



Basic goat facilities – adequate shelter must be provided all year around

Does kidding in cold months (November to March) will need more secure and sheltered quarters. Some breeders allow goats to kid in large community pens, but individual kidding pens help to restrict the spread of any contagious diseases that may be passed in fetal fluids and membranes. Individual pens also reduce confusion by the operator and does about which kids belong to which does.

Barns and yards designed for sheep operations can be adapted for goats. Generally, interior panels should be taller than those for sheep, but otherwise the requirements are much the same.

Shelter Requirements

Kid (hand fed)	0.3 - 0.5 m^2 (3 - 5 ft^2)
Feeder	0.6 m^2 (6 ft^2)
Doe and 1 - 3 kids	1.2 - 2.5 m^2 (12 - 25 ft^2)
Dry doe	1.0 m^2 (10 ft^2)
Pregnant doe	1.5 m^2 (15 ft^2)
Buck	2.5 - 4 m^2 (25 - 40 ft^2)

20 cu. ft/animal/minute (winter); 150 - 200 cu. ft/animal/minute (summer)

Kidding Pen

1.2 m x 1.5 m (4 x 5 ft) minimum

Because goats are readier mothers than sheep, they may not need separate mothering-up pens, but it is helpful to have a few portable panels that can be set up in a corner for any doe or small group that needs it. Ventilation is extremely important here, and so is freedom from drafts.

Does in late pregnancy, fresh (lactating) does and growing kids need generous amounts of clean water. An automatic waterer or a trough with a de-icer can be set up to serve from two to four pens. Be sure goats cannot contaminate water supplies. Drinking water that is contaminated with manure is a major route of parasite transmission. Waterers should be situated on a concrete pad that is well drained all around.

Yards must be well drained, especially when kids are present. If possible, turn does with kids into pens that have been unused for two months or more, or that have been scraped clean, limed and thoroughly dried in the sun.

When feeding in confinement, a creep area for the kids will give them a quick start on solid feed, as well as a place to escape bullying.

Water, Surface Area

Lactating does	0.1 m^2 (1 ft^2)/20 head
Others	0.1 m^2 (1 ft^2)/40 head

Exercise Yard

Doe/buck	1.5 m^2 (15 ft^2)/head – hard surface 7 m^2 (70 ft^2)/head – soil surface
Feeder	0.6m^2 (6 ft^2)/head – hard surface 3 m^2 (30 ft^2)/head – soil surface

(Soil-surfaced yards should be used only where annual precipitation is less than 50 mm. A paved feeding strip should be provided adjacent to each feed bunk. This paved strip should be at least 2 m wide, or as wide as the tractor used for cleaning, and the strip should slope at 5 cm per metre away from the feed bunk.)

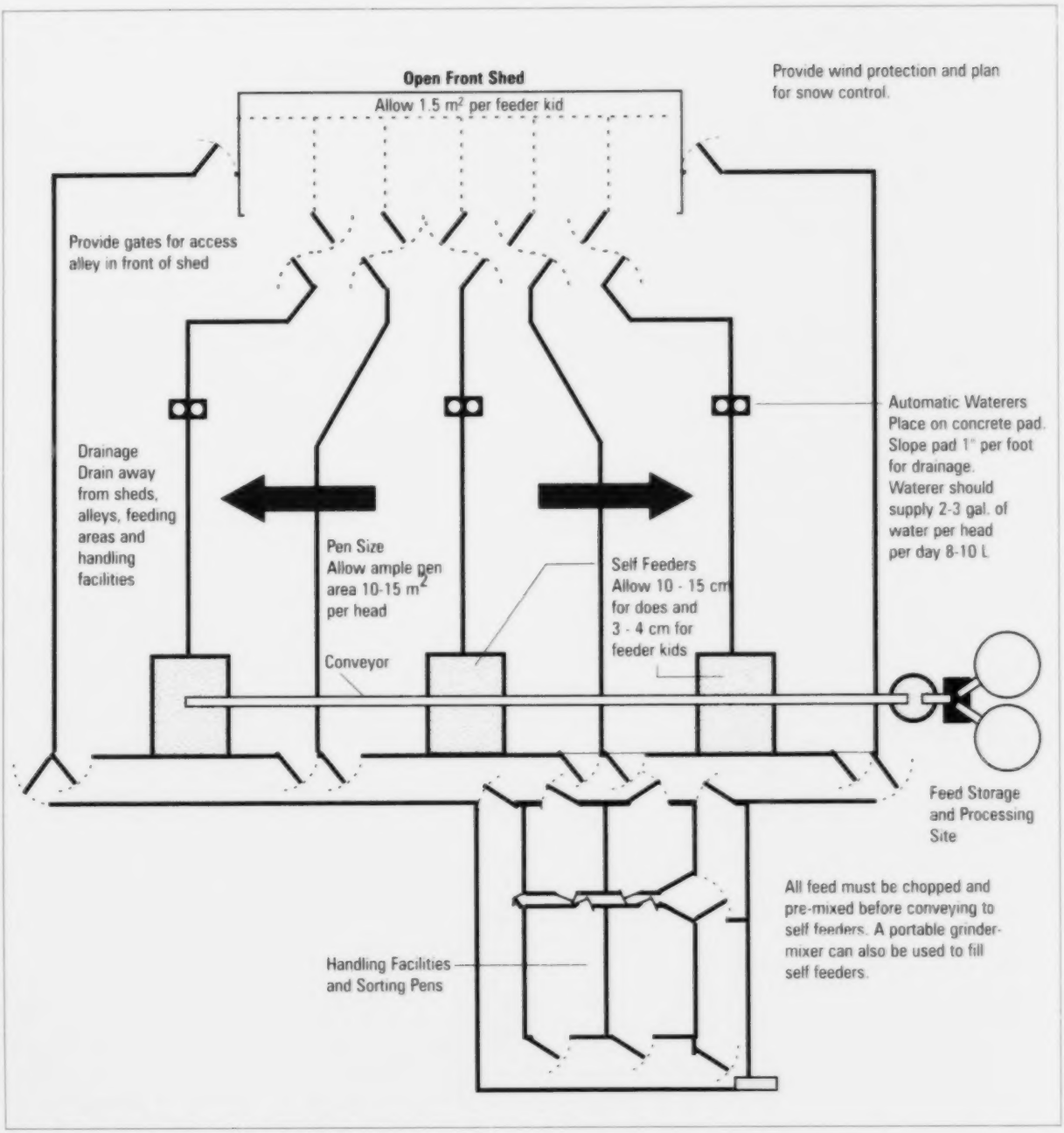
Feeders

Feeders are a necessity for goats. A well-designed and properly placed feeder not only saves feed and money for the producer, it also keeps the goats healthier by protecting feed from contamination.

Most producers feed some form of forage and make it available to the goats most or all of the time. The forage can be offered in racks or in one of the feeders illustrated here. There should be enough space for all of the goats to eat at the same time.

When feeding grain, ensure that the troughs are designed to protect the grain from fecal contamination.

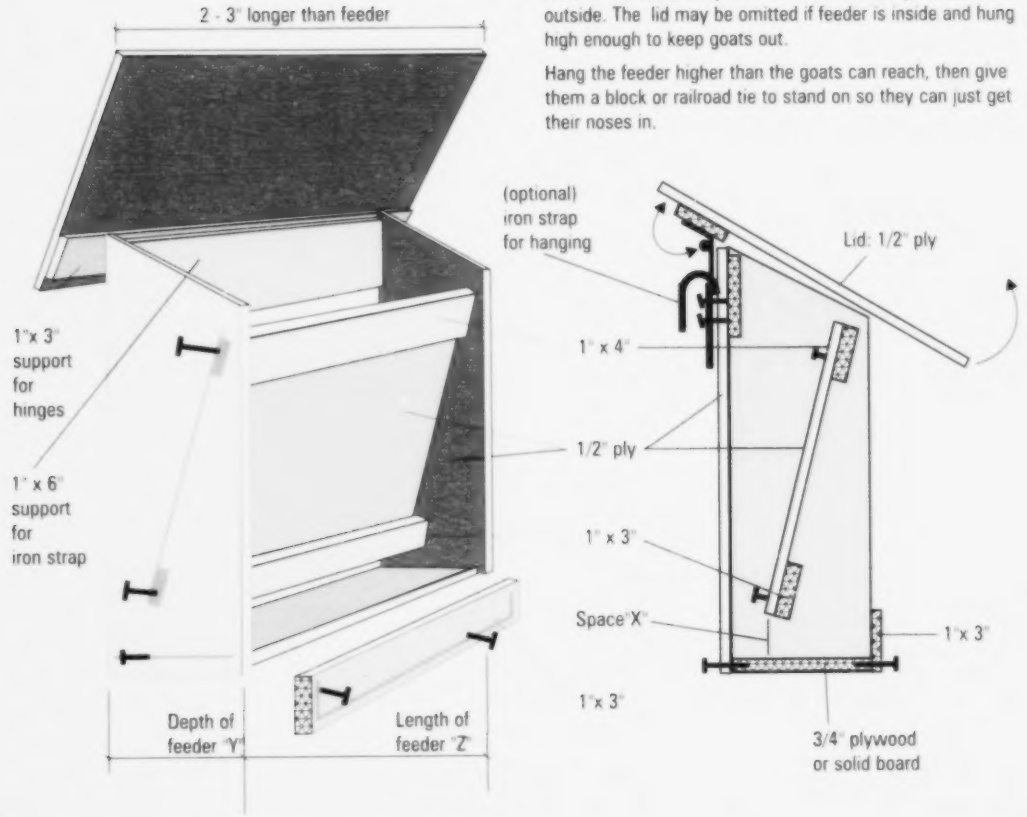
This hay feeder has a roof that slides back for hay to be inserted


Open Front Shed
Allow 1.5 m² per feeder kid
Provide wind protection and plan for snow control.
Provide gates for access alley in front of shed
Automatic Waterers
Place on concrete pad. Slope pad 1" per foot for drainage. Waterer should supply 2-3 gal. of water per head per day 8-10 L
Drainage
Drain away from sheds, alleys, feeding areas and handling facilities
Pen Size
Allow ample pen area 10-15 m² per head
Self Feeders
Allow 10 - 15 cm for does and 3 - 4 cm for feeder kids
Conveyor
Feed Storage and Processing Site
All feed must be chopped and pre-mixed before conveying to self feeders. A portable grinder-mixer can also be used to fill self feeders.
Handling Facilities and Sorting Pens

Confinement goat lot with self feeders

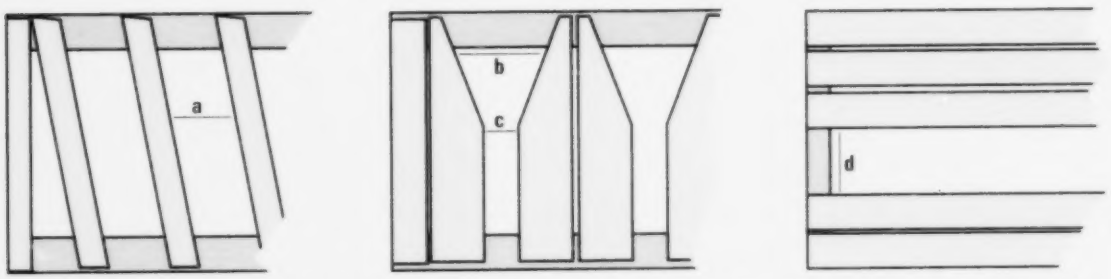
A lid is needed to keep feed or salt/mineral dry if used outside. The lid may be omitted if feeder is inside and hung high enough to keep goats out.

Hang the feeder higher than the goats can reach, then give them a block or railroad tie to stand on so they can just get their noses in.



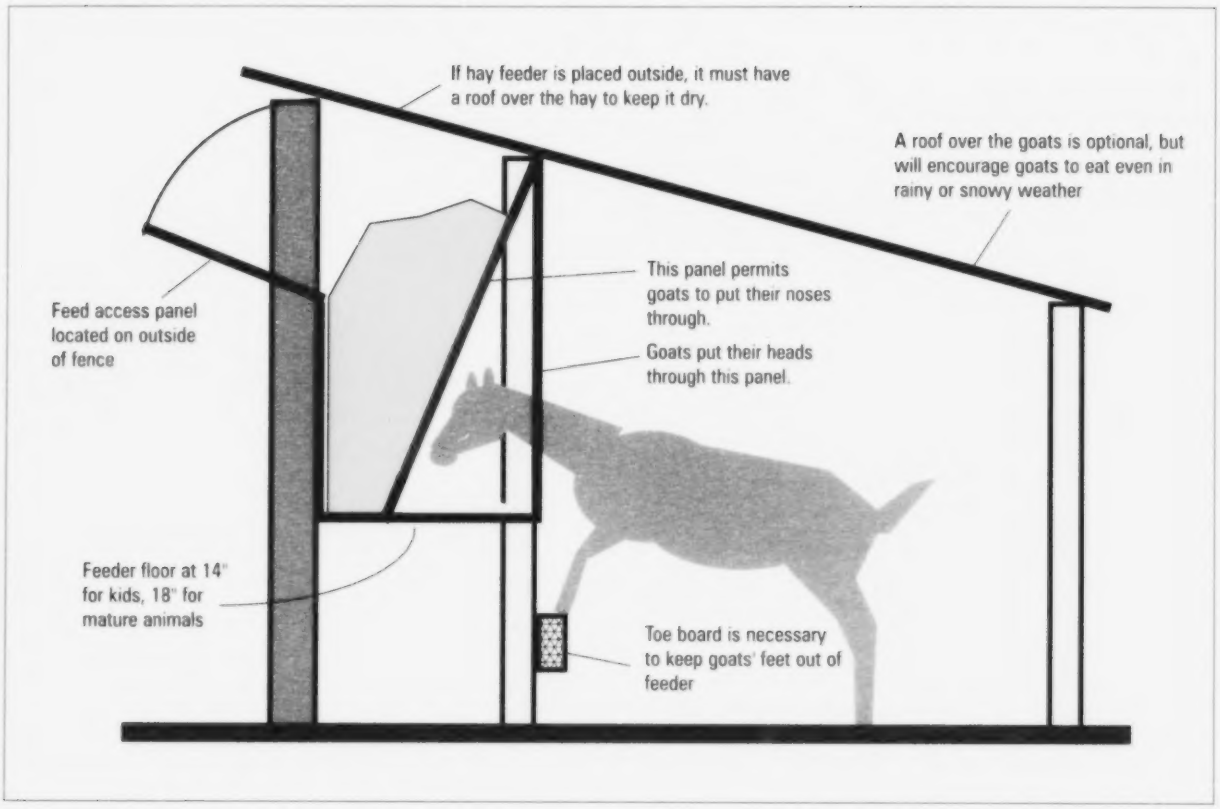
Depth "Y" and Length "Z" according to the number of goats to be fed, if using this feeder for grain. Salt/mineral box does not need to be as long because goats do not all eat at once. Space "X" depends on material being fed: salt/mineral 5/8" - 1"; grain 1-1/2" -2".

Mineral or grain feeder for goats

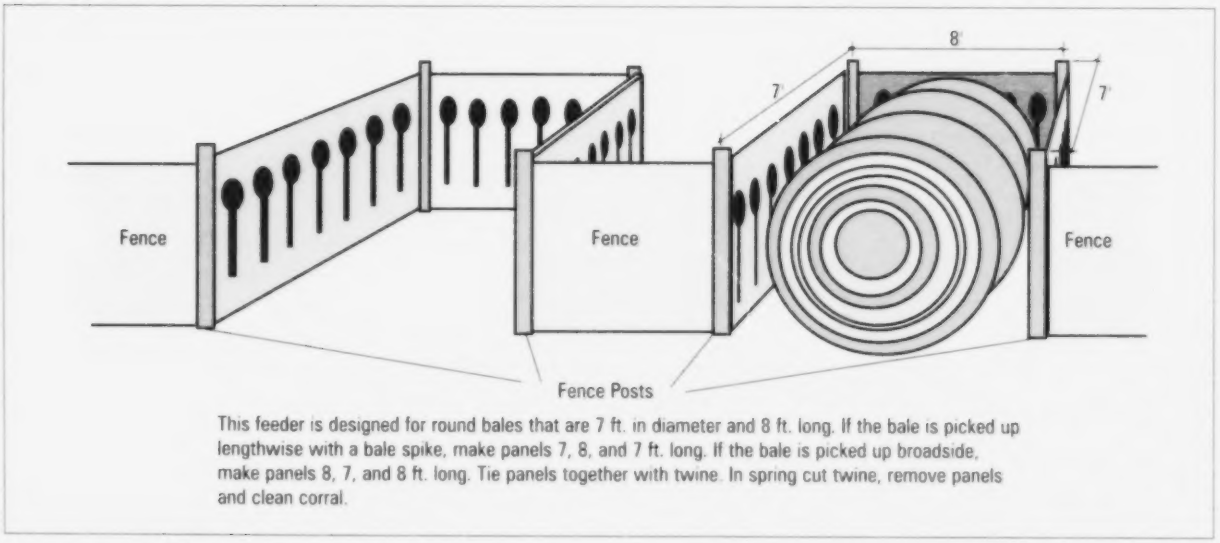


Measurements: **a**: 7" for does; 9" for bucks **b**: 12" wide at top **c**: 4-1/2" for does; 3" for kids; 6" for bucks **d**: as high as possible for goats to reach while standing on toe board. Measurements may need to be adjusted for goats with horns.

Goat feeder panel styles


If hay feeder is placed outside, it must have a roof over the hay to keep it dry.
A roof over the goats is optional, but will encourage goats to eat even in rainy or snowy weather
This panel permits goats to put their noses through.
Goats put their heads through this panel.
Feed access panel located on outside of fence
Feeder floor at 14" for kids, 18" for mature animals
Toe board is necessary to keep goats' feet out of feeder

Minimum-waste hay feeder for goats



This feeder is designed for round bales that are 7 ft. in diameter and 8 ft. long. If the bale is picked up lengthwise with a bale spike, make panels 7, 8, and 7 ft. long. If the bale is picked up broadside, make panels 8, 7, and 8 ft. long. Tie panels together with twine. In spring cut twine, remove panels and clean corral.

Fenceline round bale feeder for goats

Hay Feeder

Does – length/head	400 mm (16 in.)/head
Replacements/feeders	300 mm (12 in.)/head
Height at throat – does and bucks	450 mm (18 in.)
Replacements/feeders	350 mm (14 in.)

Feed Storage

Hay	
Milking does	2 kg/hd/day
Dry does and bucks	1.5 kg/hd/day
Replacements/feeders	1 kg/hd/day
Grain	
Does with kids	1 kg/hd/day
Late pregnancy	0.5 kg/hd/day (60 days)
Flushing doe	0.5 kg/hd/day (60 days)
Breeding buck	0.5 kg/hd/day (90 days/yr)
Feeder	0.25 kg/hd/day (maintenance) 0.5 - 1 kg/hd/day (finishing)

Bedding Storage

Does and bucks	3/4 lb/hd/day
Feeders	1/4 lb/hd/day

Feed Storage

Each type of feed must be stored so that it retains maximum quality throughout the storage period. It must be accessible in all weather, but must be inaccessible to livestock.

Baled hay and straw should be thoroughly dry when put under a roof, to avoid the danger of overheating and fire. If tarpaulins are used to protect bales, they must be in good repair.

Grain is a dangerous feed if goats break into a large supply. Make sure goats are fenced away from granaries. Do not keep large quantities of grain because grain that spoils can be toxic to goats. Make sure storage facilities are dry. Salt and minerals must also be kept dry to maintain their quality.

Predator Control

Electric predator fences, erected around the perimeter of pastures, have proven effective for protecting goats from coyotes, bears and other predators. Electric fences also prevent goats from escaping.

Another way to minimize predation is to keep a guard dog with the herd. Some breeds (Pyrenees, Komondor, Kuvasz, etc.) are instinctive guardians and provide effective predator control when properly trained. As for other breeds of dogs, some cannot be trusted not to molest the goats.

A guardian puppy must be raised with the goats so that it bonds with the herd. The puppy will also need a place of refuge where it can seek shelter from aggressive goats. These dogs must not be thought of as pets if they are to do their job of defending the herd from other dogs and predators, including thieves. Breeders of guardian dogs can provide more information on the qualities of their animals and generally will guarantee good behaviour.

If the pasture or pens patrolled by a guard dog are adjacent to a neighbour's yard or out buildings, a guard dog will likely have unwelcome interactions with the neighbours and their dogs. In these cases a guard donkey is more likely to succeed.

Donkeys and llamas are also effective guardian animals for goats, but individual animals seem to be better than others. Ask the breeder if any of his animals have been kept with goats. Some donkeys and llamas can readily adapt from sheep to goats. A breeder may allow you to return an animal if it does not prove satisfactory within a reasonable time.

Nutrition

Goats are ruminants. This means that in addition to a stomach, goats have a large fermentation vat, called the rumen, as part of their digestive system. The fully developed rumen is a strong muscular organ, which uses regular contractions to stir up the feed inside it. The rumen contractions are often apparent on the left side of the goat through the para-lumbar fossa.

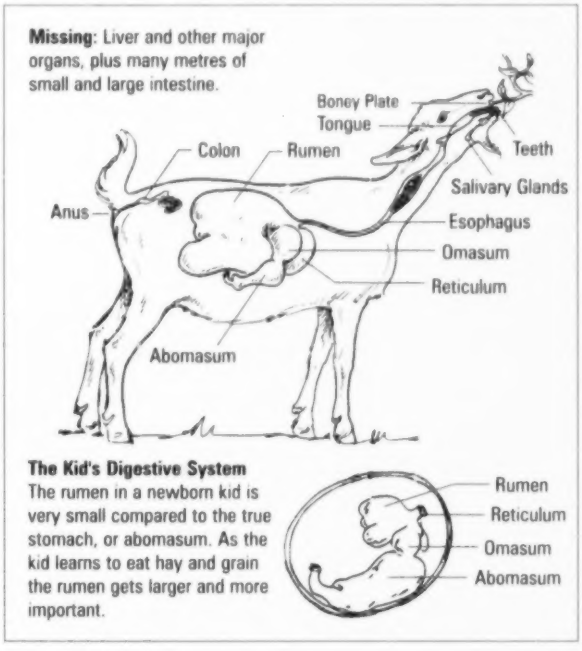
The rumen is a big biological factory. It prepares food for digestion by decomposing large compounds and transferring smaller ones. The rumen churns fibrous feed (which cannot be digested by humans or any other single-stomached animal) into a fluid mixture containing large numbers of bacteria and protozoa. These microbes digest cellulose fibres and produce volatile fatty acids (VFAs), which a goat can absorb for energy. In addition, the micro-organisms use the feed to multiply and thrive. The surplus microbial population washed down the digestive tract with the rest of the feed becomes the major protein source for the goat. Depending on the ratio of forage and concentrate in the diet, up to 90 per cent of the nutrients absorbed by the goat are due to microbial action.

The microbes in the rumen also manufacture vitamins essential to the goat, such as vitamin K and all the B vitamins. Sudden changes in feed upset the microbe balance of the rumen, which can lead to severe illness or even death of a goat.

Goats eat selectively, using their mobile lips to choose tender twigs and leaves. When grazing or browsing, goats pack food as quickly as possible into the rumen, with little or no chewing. Later, the goat will burp the feed up in small wads (cud) and chew it to break the feed down for digestion. Cud chewing also adds saliva to the feed, which helps keep the rumen fluid from becoming too acidic.

Once the feed has been reduced to the consistency of porridge, it passes through the reticulum and omasum into the abomasum (true stomach) after which digestion proceeds as it does for animals such as horses and pigs, which have only one stomach. Digestive fluids are added in the true stomach and upper intestine. Most of the remaining nutrients are assimilated in the small intestine. Excess water is removed in the large intestine, and the residue is excreted as dry fecal pellets.

This complicated digestive system is not yet functioning when a kid is born. The rumen of a new-born kid is very small and contains no micro-organisms. At first, only the abomasum is functional. Kids are monogastric when they are born. New-born kids are only capable of digesting milk, and for a few days this is all the kid can eat. As the kid nibbles on feed or bedding, it picks up the microbes that will help it to digest cellulose fibres. Fibres and microbes lodge in the rumen, which responds by becoming larger and more active. By encouraging the consumption of vegetables and grassess, a goat keeper can help a kid develop its rumen earlier, to a point where all the nutrients necessary for growth can be supplied by concentrate and forage within six weeks of birth. The kid can safely be weaned at this time if necessary.



The digestive system

Nutrient Requirements

A nutrient is any substance that an animal needs to live and function. Goats need the following nutrients: water, energy, protein, minerals and vitamins.

Water

Apart from its use in maintaining life, water is needed for kids to grow properly. Does in late pregnancy need generous water supplies to avoid kidding problems and to produce milk to their potential after kidding. Studies have determined that approximately 3.5 kg of water is consumed for each kilogram of milk produced by dairy goats under temperate conditions. This is in addition to maintenance needs.

The trouble or expense of providing goats with the freshest, cleanest water possible on a daily basis is well justified by the advantages obtained in health and production. If water is contaminated with manure, goats will refuse to drink until they are forced by thirst. Contaminated water is a common source of infection by coccidia and other parasites. Water may also become a source of infections (such as Johne's disease) that develop later in life.

Goats that are on maintenance rations – bucks and even pregnant does until mid-pregnancy – can survive on snow, but they will need extra energy to compensate for the energy lost by melting the snow in their bodies. The goatkeeper must ensure animals have access to fresh clean snow at all times.

Lactating does have the highest demand for water. If a doe is short of water, she will reduce milk production according to the supply of water that is available. In very cold weather, lactating does prefer warm water (up to 45°C) if they can get it. An automatic heated waterer will ensure palatable water is always available. In a small herd with limited facilities, a thermostatically controlled electric de-icer is adequate.

In hot weather, all goats should have free access to water and shelter. Bucks especially need attention in this regard to avoid problems with infertility that can occur six to eight weeks following a hot spell.

Energy

Energy is the goat's "fuel." Energy is needed for movement, growth, tissue maintenance and milk production. A deficiency of energy is one of the most common nutritional problems. It can result in reduced growth rates, loss of milk production, conception problems, and increased mortality owing to an inability to fight off disease.

A goat's energy requirements are related to its size, rate of growth or lactation, and the weather. Cold weather can increase energy needs by 10 per cent or more.

Goats obtain energy from all the foods they eat, but especially from grain and other concentrates. This energy is commonly measured in Mega-calories (Mcal) of Digestible Energy (DE). It can also be expressed as a percentage of feed weight or Total Digestible Nutrients (TDN).

Protein

Most of an animal's body is composed of protein. Goats obtain protein from the feed and rumen microbes they digest. Rumen microbes use protein in the feed and combine non-protein nitrogen with feed to make amino acids, the building blocks of protein.

Non-protein nitrogen (NPN), usually urea, can be used in small amounts by goats on maintenance diets. The NPN content should never comprise more than the equivalent of 12 per cent of the protein in the concentrate portion of the ration. Urea is not generally recommended for goats.

Does that are producing less than two litres of milk per day can meet most of their protein needs with the microbial protein produced in the rumen. They need only about 11 to 12 per cent of protein in their diet. Goats with high protein requirements – milking does and growing kids – benefit from high-quality "by-pass" protein, which can be digested directly in the abomasum and intestines.

The primary sign of a protein deficiency is a depressed appetite. Reduced feed intake can cause energy intake to fall; therefore protein deficiencies are often accompanied by energy deficiencies. Other signs of a protein deficiency include reduced milk production, irregular or delayed estrus (heat) of breeding females, loss of weight or slow growth.

Early cut, leafy legume hay is an excellent source of protein. Protein can also be boosted by adding supplements to the concentrate portion of the ration. Supplements available include soybean or canola meal and 32 per cent pellets.

Care needs to be taken to ensure the goat:

- has a balanced diet
- has access to fresh water
- avoids excessive protein supplementation

Calcium and Phosphorus

Calcium and phosphorus are important for the formation of bones and teeth, the functions of many soft tissues (including nerves) and the production of milk. The ideal ratio of these minerals in the total diet is 1.5 parts calcium to 1 part phosphorus (written as 1.5:1). Goats can tolerate ratios from as low as 1.2:1 to as high as 7:1 if both are adequately supplied. A gross oversupply of one can produce the symptoms of a deficiency of the other.

A deficiency of either calcium or phosphorus in a lactating doe will eventually lead to a decline in milk production. If the deficiency does not last long, the doe can draw on body stores of calcium in the bones without affecting milk yield. In growing goats, an imbalance or shortage of calcium or phosphorus will cause slow growth, unthrifty appearance and deformation of bones, especially the legs.

Milk fever, or hypocalcemia, occasionally occurs in goats. It has been thought to be caused by excess calcium intake in late pregnancy, but new evidence suggests that this may not be as important as other imbalances. It is suggested that producers may continue to feed high quality legume hay (despite its high calcium content) to does in late pregnancy if this provides the best energy level in the diet. Some nutritionists recommend feeding certain salts (magnesium sulphate, magnesium chloride or ammonium sulphate) to the doe just before kidding if milk fever is expected to be a problem (see milk fever).

Excess phosphorus in a buck's ration, usually due to high grain rations, can cause urinary calculi to form, which block the urethra and prevent the excretion of urine. Although urinary calculi can occur in does, it is rarely a serious problem due to the doe's larger diameter urethra (see urinary calculi).

If the calcium-phosphorus ratio in the goat's diet must be adjusted, a mineral mix containing the appropriate proportions of these minerals may be mixed with the salt or fed in the concentrate mixture.

If the goats are in pasture, it is recommended to determine the soil/grass mineral content, before actually providing any mineral supplementation. In this manner, oversupply of certain minerals is avoided.

Salt

Salt is needed by all animals to maintain fluid balances in the body.

Salt may be part of the concentrate ration or made directly available to goats on a self-feeding basis. The loose form of salt is recommended over block salt, which is not eaten easily, particularly in the winter.

Salt is the only mineral that livestock can be relied upon to seek out when they feel a need for it. Therefore, salt is commonly used as a carrier of supplementary trace minerals required by the animals. If a salt/mineral mix is used to supply necessary minerals, then this is the only salt that should be available to the goats.

High levels of salt in water supplies or in the feed will limit a goat's consumption of free choice salt. If a herd is observed to be eating less salt than expected (0.5 per cent of total dry matter intake is normal), the level of mineral supplementation required must be re-evaluated with the help of a nutritionist.

Salt can also be used to limit the consumption of a particular feed or mineral. A large proportion of salt prevents goats from overindulging in a favourite feed. A nutritionist can help a producer plan this kind of feeding program.

Trace Minerals

Many minerals are required by goats in very small quantities. The quantities involved are measured in parts per million – even parts per billion – of feed consumed; however, deficiencies do occur. Most of the feeds produced in Alberta cannot meet a goat's need for selenium, copper, zinc and manganese. A few areas are less deficient than others, so consult with a livestock nutritionist or veterinarian before supplementing untested feed. A feed test is the most reliable way to determine which minerals you will need to add.

Minerals may be fed by mixing them with salt or incorporating them in the concentrate ration.

Suggested Mineral Levels in Total Ration

Mineral Minimum – Maximum	Comments
Cobalt 0.1 ppm - 10 ppm	Deficiency symptoms: loss of appetite, emaciation, weakness, anemia, decreased production. Usually adequately supplied in salt at 1 - 2 ppm.
Copper 10 ppm - 80 ppm	Deficiency symptoms may occur in presence of an oversupply of molybdenum. Signs: anemia, rough "bleached" coat, bone deformities, possibly diarrhea or uncoordination. Copper requirements and tolerance of goats are similar to cattle, and much higher than that of sheep.
Iodine 0.5 ppm - 50 ppm	Deficiency symptoms: goitre (swelling in upper throat), reproductive problems – late-term abortion, hairless fetus or weak kids. Signs of toxicity (overdose): dry, rough coat, watering eyes, reproductive problems.
Iron 50 ppm - 1000 ppm	Deficiency rarely occurs except in kids fed exclusively on milk.
Magnesium 0.18%	Acute deficiencies arise on fast-growing lush pasture. Signs: staggering, convulsions, death. Prevention: feed hay before turning onto pasture. Treatment: intravenous magnesium salts. Low dietary levels reduce milk production.
Manganese 40 ppm - 1,000 ppm	Deficiency symptoms: reluctance to walk, deformity of forelegs, delayed onset of estrus, poor conception rate, low birth weight of kids.
Potassium 0.8%	Deficiencies rare in roughage-based diets but occur occasionally in high-concentrate feeding: poor appetite, stiffening progressing from front to rear, urinary calculi.
Selenium 0.2 ppm - 3 ppm	Deficiency symptoms: unthriftiness or poor growth rate with poor supply; severe deficiency contributes to white muscle disease, causing progressive paralysis of limbs and sudden death from heart attack in growing kids. Deficiency in doe leads to early embryonic death and retained placenta. Signs of toxicity: chronic – erosion of joints causing lameness, dullness, emaciation; acute – poor appetite, impairment of vision, staggering, paralysis, death.
Sulphur 0.2% - 0.32%	Shortages may occur in rations containing a high percentage of NPN. Signs: poor performance, hair loss, excessive saliva, watering eyes.
Zinc 40 ppm - 500 ppm	Deficiency symptoms: listlessness, poor growth, skin problems - dermatitis, thick dry patches, hair loss, lesions around hooves and eyes; in males, reduced testicular growth, poor libido, infertility.

Vitamins

Strictly speaking, vitamins are not nutrients. Vitamins enable the animal to use nutrients to maintain body processes, produce milk, meat, hair, and reproduce.

Rumen microbes are responsible for manufacturing many of the vitamins the goat needs. This is one reason why rumen health is important. A bout of indigestion or acidosis of the rumen can destroy large numbers of friendly bacteria in the rumen, which will lead within hours or days to a severe shortage of thiamine, (vitamin B_1). A vitamin B_1 deficiency causes staggering, convulsions and death (polioencephalomalacia or polio for short).

All trace-mineralized salt sold in Alberta contains cobalt. Rumen microbes need cobalt to synthesize the B vitamins, vitamin C and vitamin K that goats require under normal circumstances. The exception may be very high-producing does, who sometimes require supplementation with one or more of these vitamins.

Animals that have been off-feed for any reason will often recover more quickly with an oral or intramuscular administration of B complex vitamins. Feeding B vitamins to animals during changes in rations may help to prevent problems.

While bacteria in the digestive system do manufacture many vitamins, they do not produce vitamins A, D and E. These vitamins must be obtained from feed. Vitamin D can also be formed in the skin by the action of sunlight. Surpluses of vitamin A, D and E are stored in the liver or fatty tissue of the body for future use.

Vitamin A originates from substances, such as beta carotene in fresh green plants, which are converted in the body into the usable form of the vitamin. Excess vitamin A is stored in the liver and used by the body when an adequate amount of the vitamin is not being obtained daily. Pregnant animals deficient in vitamin A may give birth to weak, disease-susceptible kids without showing deficiency symptoms themselves. Producers are advised to supplement this vitamin from August until the goats are released onto abundant spring pasture.

Vitamin A is needed by does to produce milk and for bone development in kids. Vitamin A is vital to the health of epithelial tissue — namely, the skin, hair, eyes, and the linings of the digestive, reproductive, urinary and respiratory tracts. Deficiency symptoms include watery eyes, thick nasal discharge and respiratory problems, loss of appetite, loss of weight, unthrifty appearance, and birth of weak or dead kids.

Growing kids need from 1,200 to 2,000 International Units (I.U.) of vitamin A per day. An 80 kg doe will need about 3,000 I.U./day when she is dry or in early pregnancy, then 4,100 I.U./day in late pregnancy. When the doe gives birth and starts producing milk, her requirements can jump to 20,000 I.U./day. A doe that does not have enough vitamin A stored in the liver will simply be unable to produce to her potential.

Goatkeepers can provide animals with vitamin A orally or through injections. A two-month supply may be injected at one time. Vitamin A is available in an emulsified liquid that can be added to the water. If vitamin A is administered this way, withhold water from the goats for half a day or so and then give them a good fresh supply of water with a week's vitamin A added to the water. Vitamin A can also be fed in the salt/mineral mixture at a rate of 25 to 50 g of vitamin ADE premix (10,000,000 I.U. of vitamin A/kg) per kilogram of salt in the mix. This vitaminized mixture should be replaced with fresh premix every week.

Vitamin D, the "sunshine vitamin," is required to build strong bones in growing animals and to prevent a form of rickets in pregnant does. Rickets is a condition in which bones are soft and irregular in shape, tending to bend under the weight of the animal. A deficiency is unlikely to occur if animals are exposed to sunlight for at least an hour a day. Most vitamin A supplements also contain some vitamin D to be on the safe side.

Vitamin E is an important component of the cell wall. In combination with selenium it prevents white muscle disease in growing animals. It is added to most vitamin A preparations as an anti-oxidant to prevent spoilage. As a feed additive, vitamin E is expensive and rarely required by a meat herd.

Feed Testing

Goats will decide on their own how palatable a feed is. With experience you may be able to make a good guess as to the approximate energy and protein values of a feed based on its composition and stage of maturity, but there is no way to be sure of the actual nutrient content without a feed test. Minerals, in particular, can be in dangerously short supply without affecting the appearance of the feed in any way.

A livestock specialist or a nutritionist can help you test feed. Be sure you test a representative cross-section of the feed that is available. Both forages and grains may be sampled, but grain mixes should have the various grains tested individually.

When a feed testing laboratory gives a report about a forage sample, it includes moisture content, crude protein, fibre, calcium, phosphorus and nitrate levels, plus an estimate of digestible energy if requested. A grain analysis report includes bushel weight, moisture, protein, and phosphorus. A nutritionist can supply ration recommendations based on information you give about your herd. Accurate knowledge of your feed ingredients will enable you to feed your herd for maximum production and profit.

Feeding Goats

Always use feeders. Never feed goats on the ground. Contamination of feed from fecal material carried on feet or deposited directly in the feed will reduce the feed efficiency of the herd and will increase the risk of spreading infections in the herd.

Goats have low resistance to most parasites carried in the intestinal tract. Many serious diseases are passed in feces or other discharges and collect on the ground.

Using proper feeders also reduces unnecessary waste. It is estimated that any hay seen on the ground around the hay feeder means you are losing at least 10 per cent of the feed. Take this into consideration when estimating feed consumption.

Forage

Forage is the basic ingredient of a ruminant's diet. Most forage is cellulose and can only be digested by rumen bacteria. The term forage is applied to stems and leaves of grasses and legumes, which goats obtain on pasture and from straw and hay. Some producers chop or slice twigs and small branches to feed to goats in confinement. Forage stimulates the rumen and maintains healthy rumen function. Goats must be fed stored forage when adequate pasture is not available, usually from October to May. Adequate diets can be formulated using almost any forage base, but the most common rations are based on feeding hay of some type. Hay silage may be fed but it is recommended that long hay be offered as well at certain stages of the production cycle.

Hay, whether grass or legume, that has been cut in the pre-bloom stage of the plant's growth is more nutritious than hay that has been cut after maturity, when woody lignins have replaced digestible cellulose and starches. The greater the demand for production from your herd, the higher the quality of hay you will need. On the other hand, goats on maintenance rations – bucks out of breeding season, large kids, dry yearlings and non-lactating does in early pregnancy – may be fed a fairly low-protein hay (11 - 12 per cent) and be the better for it, because the large quantities of hay required are excellent for developing rumen function and muscle tone.

Dusty or mouldy hay is never recommended for goats, especially pregnant does. Certain mold spores may affect the fetus, sometimes causing abortion. Goats can also become allergic to molds, wheezing and coughing when fed hay containing the spores.

Grain

Grain or concentrate is usually fed to boost the intake of energy or phosphorus. It may be simply whole grain or a mixture of grain and supplements, possibly in pellet form. Measure all grain by weight. Two of the more popular feed grains in Alberta are barley and oats. Remember that barley is half again as heavy as oats on a volume basis and should be accounted for when switching from one feed to another. This also applies when feeding other grains to goats such as brewer's grains or screenings from seed cleaning plants. Unusual types of feed should be tested before use.

Whole grain is as digestible to goats as is rolled or cracked grain. The disadvantage of whole grains is that added supplements may sift through to the bottom of the mix and be ignored by the goats.

Concentrate mixtures are generally based on one or more grains with an added protein source such as soybean meal or canola meal. Producers can use a high protein pellets such as a 32 per cent supplement to mix with their own grain if a higher protein level is required in an animal's diet.

A total mixed ration (TMR), when practical, is often desirable to ensure animals consistently receive the ideal proportion of feed types. A TMR includes hay or other forage as well as grain and supplements. It is usually chopped and fed loose, or compressed into pellets or small cubes.

It is always advisable to maintain adequate water supply to reduce the risk of ruminal impactions and colic.

Sample Diets

Mature Dry Does, Early Pregnancy – These does have weaned their kids. They are on a basic maintenance ration plus a small allowance for gaining weight if necessary. Coarse, bulky feed is best at this time. Young does will require proportionately less feed, but if they are very small they should be separated and offered higher quality feed to keep them growing throughout pregnancy.

Feed Type	Ration 1	Ration 2	Ration 3
Grass/legume hay (kg/day)	2.0	1.0	0.5
Oat straw (kg/day)	–	0.5	1.0
Barley (kg/day)	–	0.3	–
Oats (kg/day)	–	–	0.4
Alfalfa dehy pellets (kg/day)	–	–	–

Mature Dry Does, Late Pregnancy – Does need more energy and protein during this period because they have less capacity for feed as kids take up more room in the abdomen. A richer, less bulky diet will ensure they maintain their body weight while the fetal kids grow.

Feed Type	Ration 1	Ration 2	Ration 3
Grass/legume hay (kg/day)	1.5	–	1.0
Oat straw (kg/day)	–	0.5	0.2
Barley (kg/day)	0.75	–	1.0
Oats (kg/day)	–	0.9	–
Alfalfa dehy pellets (kg/day)	–	0.9	–

Mature Nursing Does – The nutritional needs of does are highest during lactation. The amount of milk produced largely depends on how many kids are being nursed, as the doe will attempt to produce as much as the kids require.

For a doe nursing twins, the following rations are usually sufficient. Does with triplets may require somewhat more feed.

Feed Type	Ration 1	Ration 2	Ration 3
Grass/legume hay (kg/day)	2.0	1.0	0.5
Grass gay (kg/day)	–	–	2.0
Oat straw (kg/day)	–	0.3	–
Barley (kg/day)	1.2	–	1.4
Oats (kg/day)	–	1.1	–
Alfalfa dehy pellets (kg/day)	–	–	–
32% protein supplement (kg/day)	0.3	–	0.35

Creep Rations for Kids – Many breeders use straight soybean meal to introduce kids to solid feed. Once kids are eating at least 25 g per head daily, a grower mixture can be added gradually until the kids are offered the grower mix alone. As the kids mature (18 kg or more) the protein content of the creep ration can be lowered to 16 per cent. The following are some rations that can be used in the creep area, based on batches of 100 kg.

Feed Type	Ration 1	Ration 2	Ration 3	Ration 4
Barley	80	85	–	–
Oats	–	–	85	40
Alfalfa dehy pellets	5	–	–	59
Soybean meal	14	14	–	–
32% protein supplement	–	–	15	–
18:18 mineral	0.5	0.5	–	0.5
TM salt	0.5	0.5	–	0.5
Protein content	18.5	18	18	16
Total	100%	100%	100%	100%

Reproduction

Selecting Breeding Stock

Most goats appear alike to a beginner who is shopping for a goat. The most important consideration when purchasing replacement stock, is to purchase from farms where biosecurity, animal health and prevention programs are well established and maintained. Once the goat is brought home, faults will be easier to find. Unfortunately, perfect goats do not exist, so we must all work with what we have. Any animal has as many good points as faults. A responsible breeder will try to preserve the positive traits while breeding to eliminate the undesirable ones.

Some conditions can make a goat of little or no value. Before purchasing an animal, consider health, age, reproductive potential, conformation and performance.

Health

Health is the single most important factor to consider when selecting a goat. Look at the entire herd to determine the general level of health. A healthy goat is alert and lively, moves easily and gracefully, and has a glossy coat with smooth, pliable skin. A heavy-milking doe in the first few months of lactation may look thin.

However healthy the new arrival(s) may appear, it is best to keep them isolated (no sharing of water or nose-to-nose contact with your original herd) for three to four weeks, observing them closely for the development of any signs of illness. Often the stress of moving will cause chronic conditions to become acute or at least more obvious. If this happens, it is better not to have exposed the main herd to what may be a major risk.

A few major problems to watch for are abscesses, arthritis, and mastitis. Other problems may exist in the herd, and you should be aware of what to look for.

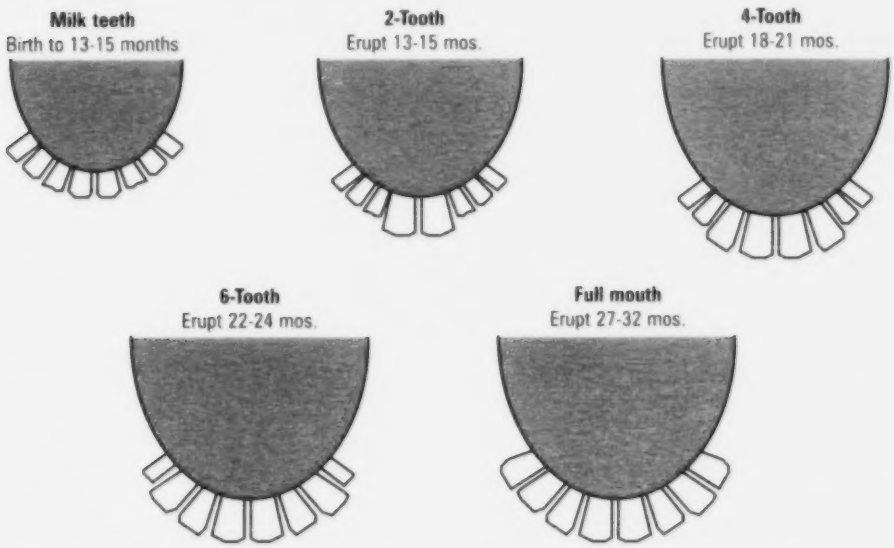
Trouble Signs to Investigate

Sign	Possible Causes
Runny eyes	iodine overdose pinkeye
Patchy, dry hair that stands up in "licks"	vitamin A deficiency skin infection louse infestation
Thin animals or evidence of diarrhea	in older animals – Johne's disease inadequate nutrition heavy parasite burdens
Undersized kids	coccidiosis, worm burdens or starvation due to poor milk production by does
Limping goats	CAE foot rot carriers poor hoof trimming
Hard, lumpy scar tissue in udder severely unbalanced udder	chronic mastitis

Any of these conditions can be severe enough to limit an animal's productivity, although good recovery is possible in many cases, after lots of hard work. If you can possibly avoid these problems, do so.

A goat with arthritis in the knees

Goats have front teeth in their lower jaw only. Their age may be roughly estimated by observing how many of the adult teeth have erupted.



Once all the adult teeth have erupted, age is difficult to determine with any accuracy. However, if all teeth are worn down to the gums (a "gummy" mouth) it is likely the animal is old. Broken or missing teeth may indicate advanced age or hard feeding conditions.

How to tell the age of goats

Age — The age of a goat is important to know. Younger animals may be assumed to have a longer useful life ahead and have greater value as breeding stock. An older doe or buck that has proven to be of exceptional genetic value may be a profitable addition to the herd, but rarely.

Heredity

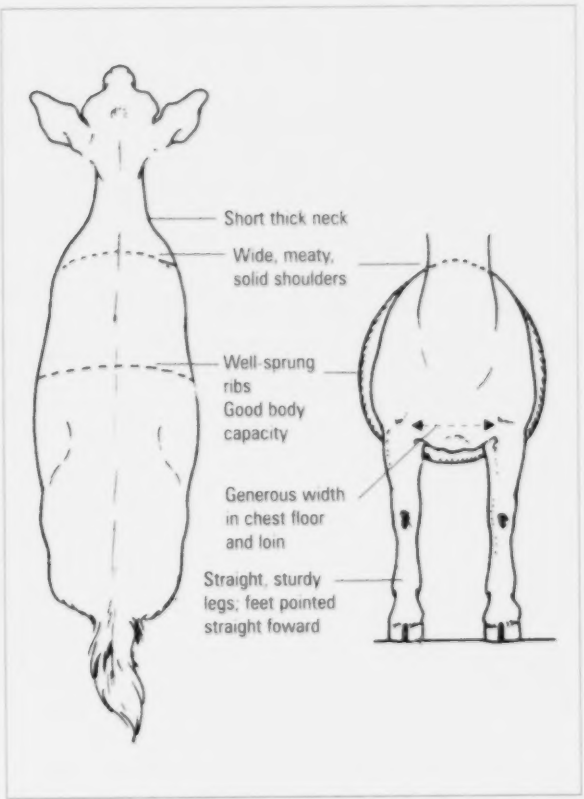
Prolificacy, or the tendency to have multiple births, is an economically important inherited trait. When buying mature does, look at the number of kids they have given birth to and weaned. Young does may have a single kid the first time, at one year of age, but should have at least twins in subsequent freshenings. When buying kids, find out how many other kids were in the birth and the age of the dam, as well as about her previous record. This same information is even more important when buying bucks.

Conformation

The goats you buy should be structurally sound. Weakness in feet, legs, back and shoulders can cause pain to an animal, which will limit the goat's desire to stand or walk to its feed. Wry or badly overshot or undershot jaws also prevent efficient feeding. Another fault that limits performance is a shallow, narrow chest and heart girth.

"Type" is the term that describes conformation in relation to the role of the animal. Dairy type refers to the physical characteristics that most often accompany high milk production and long lactations. Meat type refers to fast-gaining animals with somewhat lower milk production over a shorter lactation period. Many of the desirable traits of these two types are considered to be mutually exclusive, although sound feet, legs, and toplines and generous heart and body capacity are important to both types.

A goat used for meat production should have a blocky appearance with a short, thick neck, heavy bone, plenty of width in the chest, loin, and rump, and good body length in relation to size. The barrel is not much deeper than the chest, giving the body a "square" shape. Does used for producing meat kids do not need a large udder capacity, but the udder attachment must be secure enough to keep the udder close to the body, out of harm's way. The teats are important in a brood doe because very young kids have difficulty nursing teats that are large, low-hanging, or poorly-defined; such teats also make the doe more susceptible to mastitis. Multiple teats on a meat doe increase the risk of mastitis and are generally disfavoured by breeders.


Short thick neck
Wide, meaty, solid shoulders
Well-sprung ribs
Good body capacity
Generous width in chest floor and loin
Straight, sturdy legs; feet pointed straight foward

Meat type goat

Performance Testing

Meat goat producers looking for breeding stock should ask for the breeder's Record of Performance (R.O.P.) data. These records will state the rate of gain of weaned kids, which is a highly heritable trait.

An R.O.P. program is a service that helps breeders to calculate the average daily gain of lambs or kids, based on weights reported by the producer at three points in the kids' life. Birth weights and weights taken between 30 and 70 days are used to calculate the adjusted 50-day weight of the kid. These initial weight gains reflect the milk production ability of the dam more than the growing ability of the kid. Weights of kids taken between 80 and 120 days yield the 100 day weight. Weight gains by the kid from 50 to 100 days are considered a good indication of the kid's genetic potential. However, for this genetic potential to be reached, other conditions are required including:

- good management practices
- quality feeds
- a comfortable and clean environment

Weaned buck kids are tested for rate of gain and muscling. Kids are all fed and managed in the same way to eliminate the effects of management on their performance. Bucks that gain and measure above the average in the test are given an index above 100 in the areas in which they excel. The overall index is based on a combination of rate of gain and muscling. The superior bucks will be used to improve these qualities in future generations of meat goats. Meat goat performance tests took place in 2005 and 2006 at Lakeland College in Vermilion, Alberta.

Economic Traits

There is little point in breeding for a trait that is of no value. It makes sense to concentrate on improving the most economically important factors. A dairy producer probably wishes to improve milk production or butterfat test; a meat breeder might want higher daily gain.

However, beware the dangers of single-trait selection! Breeders should avoid concentrating on one trait to the detriment of other important traits such as conformation. Balanced selection is a slower process, but it will prevent problems such as developing a line of fast-gaining goats that, due to udder problems, are very susceptible to mastitis.

The success of a breeding program can only be evaluated by keeping accurate records. For instance, if rate of gain is important, the producer should know the original herd average for rate of gain. Kids must be identified, weighed and dates recorded. Progress can be measured if this is done year after year.

Heritability of Economic Traits of Goats

Trait	Means of Measurement	Value
High Heritability		
Mature size	tape, weigh scales	breeding stock sales, meat sales
Average daily gain	tape, weigh scales	meat sales
Butterfat production	lab test, DHI	rate of kid gain
Protein production	lab test, DHI	cheese yield
Medium Heritability		
Milk production	milk scales, DHI	milk sales, kid growth
Mastitis resistance	California mastitis test	labour and treatment costs, milk sales
Conformation	classification, observation	breeding stock sales
Low Heritability		
Longevity	age at culling	replacement rate
Reproduction	number of kids delivered	milk/yield/year, meat sales
Feet and legs	observation, classification	replacement rate, breeding stock sales

Breeding

Healthy goats receiving good nutrition are more prolific. Twins are more common than single births in mature animals, with triplets delivered almost as frequently. Kidding percentages (percentage of does kidding out of the total number exposed to the buck or inseminated) range from 75 to 87 per cent in healthy herds. The gestation period is 150 days – five months – give or take a week.

Goats can reproduce early in life; there are cases recorded of three-month-old doelings being bred and bearing kids at eight months of age, but this is not recommended, nor desirable. As with other species, good nutrition and management play a positive role in reproduction. Young bucks are usually capable of breeding by the beginning of the first breeding season following birth. If they are not to be used as breeding stock, they should be castrated before two months of age or kept strictly apart from the does, including their mothers.

Doelings often start their fertile life before they are really large enough to bear kids; a pregnancy that occurs too early can interfere with their normal growth. A young doe should weigh 30 to 35 kg before she is bred. Small does that have been bred should be maintained on a high level of nutrition throughout pregnancy, giving them a chance to grow before kidding. Also, they need to be monitored at parturition for assistance in case of a difficult birth.

After the first year, does in early pregnancy do best on a high-roughage diet with little or no concentrate. Goats are fully grown by three or four years of age, with an average body weight of 65 to 80 kg, depending on the breed and on individual genetic lines as well as on early intensive management.

Normal reproduction in goats depends on the animal taking in abundant nutrients to maintain its normal body functions before it can spare the energy required to reproduce. Disease and parasites will limit reproduction even without outward signs. Heavy milk production in a milking doe may also prevent conception until her daily milk output declines. This occurs due to the doe not having enough energy to cycle normally and maintain a pregnancy.

Reproductive Management of the Doe

In Canada, most female goats are not sexually active from April to July. During this time, the ovaries and other reproductive glands are dormant. This period coincides with the longest daily hours of sunlight. The reproductive cycle of goats is controlled in nature by the length of the day; the shorter hours of daylight following the June solstice trigger the start of the estrous cycle within 6 to 10 weeks.

Estrus, or heat, is the period when the doe is sexually receptive. The time of estrus varies from animal to animal lasting from 12 to 24 hours, or as long as three or four days. The estrous cycle is the period from the beginning of one estrus to the next. This cycle varies in length among individuals, but is generally between 17 and 22 days in length.

Young doelings tend to have shorter periods (5 to 12 days) between heats than mature does, but all does may have irregular or less obvious heats very early or late in the season.

The signs of estrus include:

- restlessness, increased bleating, increased urination
- attraction to the odour of the buck
- continuous side-to-side wagging of the tail (flagging)
- slight to moderate swelling and reddening of vulva
- clear or cloudy mucous discharge from vagina

The introduction of a buck to a herd at the beginning of the breeding season will result in the does showing signs of heat five to eight days later. If no buck is in the herd, a doe in heat will often tease one or more does into trying to mount her. In early heat she may butt heads, run away or mount the other doe, but as estrus progresses, she will stand still while being mounted. This "standing heat" is the beginning of the most fertile period, which ends with ovulation. This is the best time to breed the doe when using a natural mating system.

After this stage is over (usually about one or two days), the doe will not stand to be mounted any more, although the buck may still be interested and conception may occur if the doe is held for mounting. The recommended timing for artificial insemination is toward the end of standing heat to coincide with ovulation. Most does will cycle again within 21 days if they have not conceived and are still in the breeding season.

Most does are cycling by the end of September. Any signs of abnormal estrus – too frequent or absent – should be investigated.

Observation for heat requires extra time in the fall, watching the does without interfering with their behaviour. If does are being pen-bred, as in most meat herds, the use of a marking harness on the buck will help determine breeding dates.

Reproductive Management of the Buck

The male goat also responds to the reduced light of late summer. His neck becomes thicker, the testicles grow larger, and the buck develops the characteristic strong odour and normal habits of the species. The buck will frequently urinate on his face and beard, which intensifies the odour produced by the scent glands on the head. The backs of the front legs also become sticky and matted from this practice. The bucks will become more aggressive; even a mild-mannered buck can become very hard to handle when "in rut."

It is not particularly pleasant to handle a buck any more than necessary during the breeding season, so it is a good idea to complete the routine care before late summer. Check the collar, if he wears one, to be sure it will not become too tight. Trim the feet, administer dewormer and any necessary shots. Check the testicles to be sure the tissue feels springy and healthy. If there are any granular lumps or any hard or mushy tissue, the buck may be subfertile. Unusually small testicles, or the development of milk-producing tissue in the male udder area or teats, may also indicate potential breeding problems.

Be sure the buck is in good body condition before breeding commences, but don't let him get grossly fat. Bucks become very restless and stop eating except in snatches during breeding season, so they lose weight rapidly. Feed high quality legume hay to bucks in rut, and put out small quantities of concentrate twice a day, keeping the feed as fresh as possible. The buck will probably need a period of building-up after breeding season as well.

Water is especially important to the buck. A working buck should not be expected to survive on snow for water. A great deal of energy is needed by the animal to melt snow, and it is difficult to get enough energy into the buck during rut anyway. In cold weather, you may simply offer water, warm if possible, once a day. If you follow a routine, the buck will learn to drink when it is offered.

By arranging the feeders, water supply, and salt mineral boxes so that entry into the pen is unnecessary, you will have less trouble maintaining the buck. Be sure the fence is in good repair; if a buck is a jumper, it may be necessary to tether the animal. The shelter must be dry and well bedded; a lack of bedding in severe winter weather may result in frozen testicles and consequent infertility.

Hand Breeding/Pen Breeding

Hand breeding refers to the practice of keeping does and bucks separated, and bringing individual does in heat to the buck of choice. When several bucks are kept together, isolate the selected buck in an enclosed area outside their pen while awaiting the arrival of the doe. Of course the barrier between the common pen and the breeding pen must be especially effective.

Pen breeding is more common in meat herds. In this situation the buck shares the does' quarters for at least part of the breeding season.

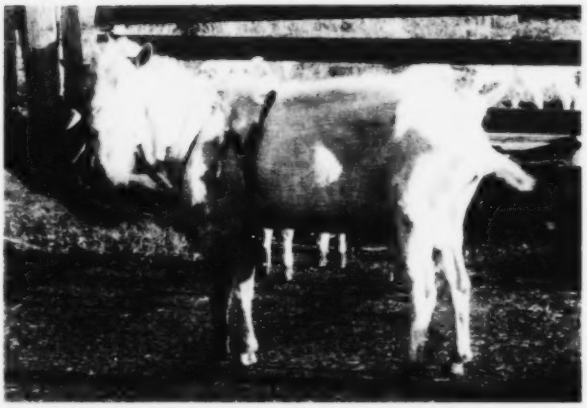
Some meat goat operators keep a buck with the herd year round, hoping for more than one kidding per year with some of the does. Changing bucks every six weeks will maintain breeding interest. The dangers of this practice include the possibility of mechanical transmission of disease when the buck breeds a doe with an infection and then passes the infection on to other healthy does.

Other producers prefer to have does kid during one time period. To do this, a fixed time breeding is required and the does need to be hormonally syncronized. This enables them to feed and treat all the does in the same way throughout the year. It also permits a uniformly sized group of meat kids to come to market on a chosen date.

Many operators run two or more bucks with the herd to guarantee a maximum conception rate, but in confined conditions the dominant buck will rarely allow less aggressive males access to any females in heat. If this buck happens to be infertile, the majority of does may be left open. Changing shifts – removing one buck and replacing him with the other twice a day – gives both bucks a chance to breed most cycling does and reduces the effect of one sterile male.

An operator who wishes to know the parentage of the kids may run a single buck with a group of does for six weeks or so (two heat cycles), then replace that buck with another to "clean up" any open females. Thus the sire of the kids can generally be determined on the basis of the kidding date.

This type of management will also reveal any subfertile or infertile bucks. These can then be removed from the herd.



Marking harness on a buck

A marking harness on the buck will help an operator identify the does that have been bred and estimate kidding dates. If a different colour of paint is used with each buck, the more active bucks can be identified.

Out-of-season Breeding

As noted earlier, most goats are seasonally non-sexual or anestrous. In Alberta this period begins around the middle of March and continues into August. Does may have shorter or longer anestrous periods, but very few does will be cycling naturally from April to June. There is interest among some meat goat producers to breed does three times in two years, which would necessitate some out-of-season breeding.

To bring does into season earlier than normal, a breeder may take advantage of a phenomenon known as the "buck effect." Keep the buck separate from the does until just before breeding is to begin. Suddenly moving the buck within sight and smell of the does will induce a synchronized "silent" (without any outward sign) heat in the does within eight days, followed by a normal heat 17 to 20 days later. Do not release the buck until just before the second heat, because conception rates and prolificacy are much improved then. This technique can be used just before the normal breeding season with good results if early kids are desired. After the does have started cycling on their own, they are less influenced by the sudden availability of a buck.

Good conception rates outside the normal breeding season can be achieved by controlling the hours of light received by the does and bucks. If late spring or early summer breeding is required, a producer may confine does under bright light in the barn, 20 hours a day for

six weeks during the winter. Does start cycling approximately 6 to 10 weeks after the lights have been shut off and the light has returned to the shorter natural day length, even if the normal day is longer than 12 hours. Alternatively, the producer may restrict light for 10 weeks before breeding is required by keeping the goats in complete darkness for all but six hours of the day. Some does may start coming into heat after about six to eight weeks. In either case, provide adequate, draft-free ventilation and clean bedding to keep the goats healthy.

Another method, which can be somewhat more precisely timed, is the use of hormones to mimic the hormonal changes of the estrous cycle. A doe coming out of the anestrous period requires a certain level of progesterone in the blood for some time before it can begin to have true ovulatory heats. With hormonal methods of out-of-season breeding, a progesterone-like hormone is given to the doe over an 11- to 21-day period as implants or vaginal sponges. Before removing the implant or sponge, or at the same time, other hormones (such as prostaglandin) may be given to bring about maturation and ovulation of eggs. Does are in heat within one to three days of implant or sponge removal. This method of breeding is labour intensive and costly, so it is rarely used in meat goat herds. It could prove worthwhile if used for marketing meat kids into the Christmas market (up to 22 kg, milk fed kids), which is chronically undersupplied and very high paying.

Prostaglandins can be used on cycling does to synchronize estrus: the injection induces heat within two days in about two thirds of cycling does. This drug is also used purposely to abort mis-bred animals, so use it with caution. Pregnant women should never handle this drug, which can be absorbed through the skin.

Prostaglandins are prescription drugs. Consult your veterinarian about the use of these products.

Pregnancy Detection

Most breeders want to know if their does have conceived as soon as possible after breeding. During the breeding season, the re-appearance of estrus is a good indicator that a doe is open, although a small percentage of does will appear to cycle even after they have been bred and are carrying kids. Does bred toward the end of the breeding season (February – March) cannot be expected to return to heat naturally if they do not conceive.

Ultrasound devices are fairly reliable for detecting pregnancy in goats as early as 25 days after breeding, if they are calibrated and operated correctly. Advances in this technology have made such products more affordable. Chemical means of testing for pregnancy have been developed, but most tests are for substances in milk and are not practical with dry does.

Some breeders can determine if a doe is pregnant, by manually palpating the abdomen. This practice is not accurate and may cause the doe to abort.

Pregnancy in a first freshening doe can be assumed with some confidence at about three months after breeding if she begins to develop a pad of mammary tissue in the proper area and if the doe has not returned to heat. False pregnancies are not uncommon, but they usually do not start making milk until late in the spring, and then often on one side only. Changes in the udder of older pregnant does are not as early or as obvious.

Development of the Fetus

The embryo enters the uterus about five days after fertilization, where it begins to form placental tissue and develop the basic form and organs of a goat. The fetus grows slowly until the last third of gestation, when it increases rapidly in size, from 1.4 cm at about 45 days, up to around 44 cm in length at birth. By the last few weeks it takes up considerable space in the doe's abdomen, and the producer must be careful to supply enough concentrated feed to nourish the doe and her kids.

Some of the more noticeable features of the developing fetus and the stage of gestation at which they appear:

- heart beat apparent ..... 20 days
- limb buds visible ..... 28 - 35 days
- differentiation of digits ..... 35 - 42 days
- nostril and eyes differentiated ..... 42 - 49 days
- eyelids close ..... 49 - 56 days
- horn pits appear ..... 77 - 84 days
- hair around eyes and muzzle ..... 98 - 105 days
- tooth eruption ..... 98 - 105 days
- hair covering body ..... 119 - 126 days
- birth ..... 147 - 155 days

Kidding

Preventing Kidding Problems

Dry off lactating does at least six to eight weeks before kidding. Check occasionally during the dry period for mastitis by feeling for lumps in the udder. Many types of chronic or low level mastitis can be cured during the dry period. In a large commercial meat herd, only does with a history of mastitis are dry-treated, if they are not culled.

Vaccinate young, previously unimmunized does with two shots (four weeks apart) of a 7-way or 8-way clostridial vaccine with the final shot administered four to six weeks before kidding. Give mature does a booster shot at this time.

Give does a vitamin E/selenium injection if a veterinarian or nutritionist recommends it. Feed or inject vitamin A regularly after August until goats have access to plentiful green growing feed.

Encourage goats to exercise by placing feed or water away from their resting area.

Keep water as fresh as possible, and accessible at all times to pregnant does.

Start feeding grain to the doe in the last six weeks of pregnancy, increasing the amount fed very gradually to about 400 to 500 g per day at freshening.

Prevent unnecessary fighting by penning small pregnant does separately from larger does. Be sure there are enough feeding stations or room at the feeders – an extra 20 per cent is recommended.

Normal Kidding

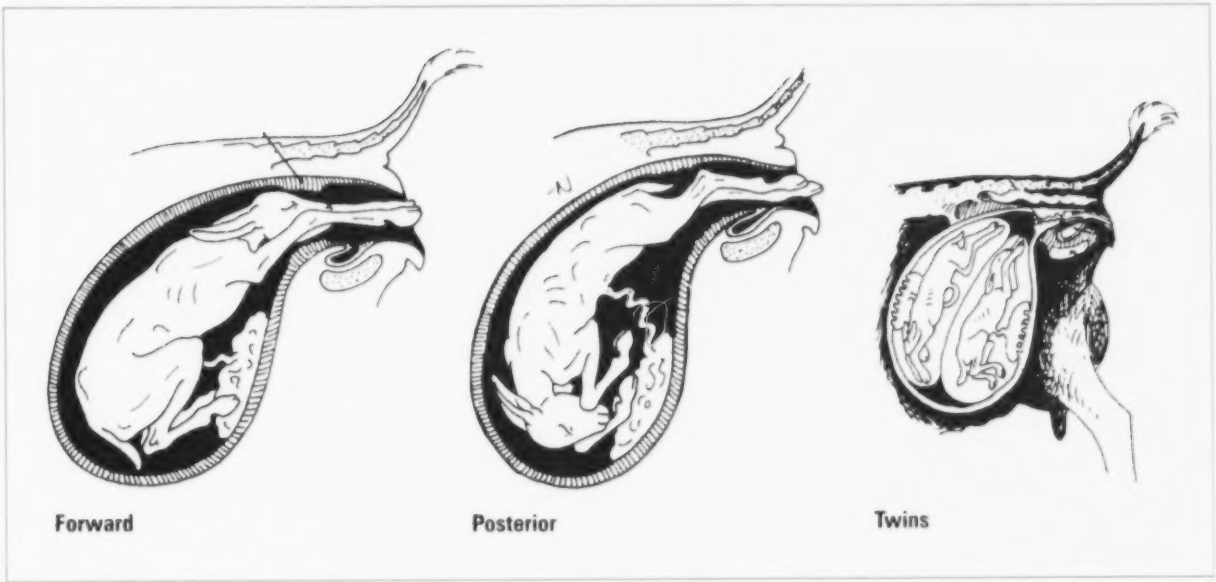
Goats kids are usually born at 147 to 155 days after conception. The process of parturition involves three stages:

- The first stage includes initiation of uterine contractions with progression of the fetus and placenta through the birth canal. This period lasts from 2 to 12 hours.
- The second stage is characterized by active abdominal pressure to expel the fetus. This period lasts from one to three hours depending on the number of fetuses.
- The last stage corresponds to the delivery of the placenta, which occurs normally within the next hour after kidding. If the placenta is not expelled by 12 hours after kidding, then it is considered to be retained.

Before labour begins, the kids normally assume a position in the uterus that will ease their passage through the narrow birth canal. In the last few days, the pregnant doe may not appear as wide as she has been. Difficult birth in does is low, with only three to five per cent of births requiring help.

Changes in the udder in late pregnancy are most obvious in the young doe, but actual milk secretion does not usually occur until she is ready to kid. Often an older doe will not fill up with milk until a few hours before kidding, when the udder quickly becomes tight and shiny. A waxy white mucous vaginal discharge is sometimes the first signal that labour has started, but can be missed or may precede serious labour by several days.

Within a day of giving birth, the doe's pelvic ligaments relax. The tail head rises and the area between it and the pin bones is so loose it is possible almost to wrap one's fingers around the tail head. The flank also looks hollow.



Normal positions

About 12-24 hours before kidding, the goat's temperature will drop a degree or so: the doe's ears will feel cooler than those of her herdmates, as the blood supply is re-directed from the extremities.

The doe becomes restless; in the wild, she would look for a quiet spot away from the herd. In the kidding pen, she investigates the walls, the bedding, the corners, the feeders, without being interested in eating. A clear, syrupy discharge from the vagina means the cervix is opening, and contractions may be many minutes apart.

Most goats paw the bedding as this stage continues, digging into the bedding right down to the ground. The doe will lie down and get up again and again, but eventually she will start to strain quite obviously.

The water bag, or amniotic sac, is sometimes presented first, but it commonly breaks in the vaginal passage, with a gush of clear fluid. Normally the first kid will follow, front feet first with the head above. Allow the doe to push the kid out if it is presented properly. The pressure helps the kid to clear its lungs. The second kid is often delivered with the hind feet first; if there is any delay after the feet are visible, the attendant can apply some traction to the kid's hind feet, gently pulling downward toward the hocks of the doe when the doe bears down, stopping when the doe rests between contractions.

Once all the kids have been delivered, the doe must pass the placenta and fetal membranes. This "cleaning" should take place within 12 hours, although it normally occurs within an hour. The stimulation of the kids suckling her, or of being milked, will often aid the doe's contractions to expel the fetal membranes. Once the membranes has passed, remove it from the pen and burn it, because it is often the means of disease transmission even though the kidding has been normal. The fetal membrane has no food value and it interferes with rumen function, but the instinct to clean up the kidding area will cause the doe to eat the fetal membranes unless these are removed immediately.

Apart from the danger of disease transmission, many people are allergic to amniotic fluid; use long plastic gloves with surgical gloves over them if you must assist at a birth. With the gloves on, wash up using a mild household detergent.

Ensure that the kids receive colostrum as soon as possible after birth, either from their dam or from a bottle with a lamb nipple. Ten per cent of bodyweight is an adequate amount of colostrum for kids to receive during the first 24 hours.

Kidding Problems

The signs that a doe is due to kid include loose pelvic ligaments, a full udder and restlessness. If nothing happens within 24 hours, the operator should make a preliminary examination. If there is a problem, perhaps you can help. If no problems are detected, let the doe proceed for a little while longer before you interfere again. A birthing complication, or dystocia, exists when the doe has been in active labour for more than 30 minutes without any progression toward delivery of the kids.

In some cases, nothing can be done to help the doe. If the value of the animal is too low to justify necessary veterinary costs, the producer may decide to euthanize a doe that cannot be helped to kid, before she suffers for too long. If the kids are taken immediately afterwards and live, they can be hand raised. However, if the doe and the kid represent good value, an emergency caesarean section may help rescue both of them.

Nubians, Saanens and pygmy goats are breeds that have a higher than usual frequency of dystocia. The most common causes of dystocia are fetal oversize, multiple births and malpresentations.

Checking the Presentation of the Kid

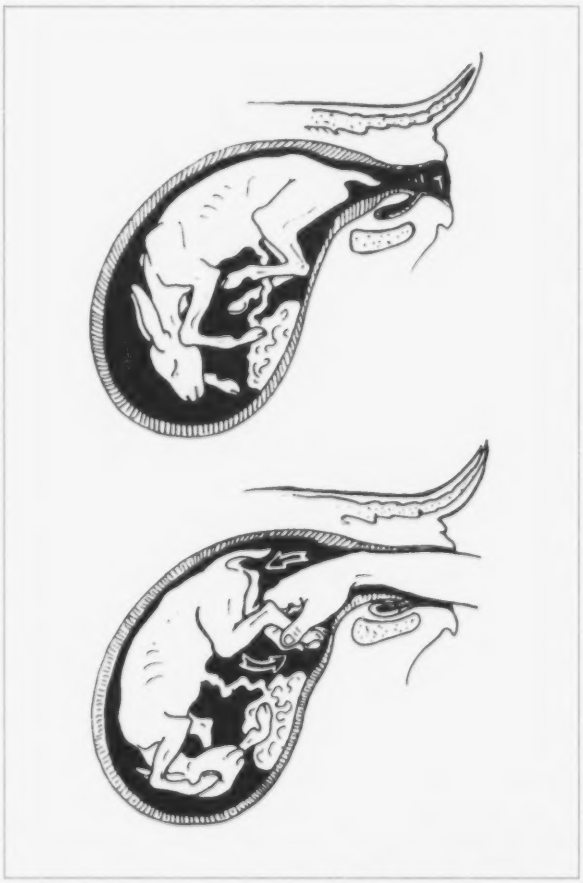
Be as clean as possible to avoid contaminating the birth passage. If gloves are not used, wash hands and scrub trimmed fingernails with soap and water. Wash everything in the area of the doe's vulva with warm, soapy water and wash hands again. Use a sterile obstetrical jelly to lubricate the hand and insert it gently into the vagina. If the passage is too small to admit a small to medium-sized hand, the pelvic ligaments may not be relaxed enough yet and birth is still some time away.

The cervix must open before the kids can be born; when it is closed it is a fairly solid lump of firm tissue to the finger touch. As it opens, it stretches thinner around the enlarging opening. When fully open, it can be felt as a fine line around the inner surface of the birth canal. If the cervix has not yet started to open when the examination is made, the operator must assume that the second stage of labour has not yet started. If the cervix is partially open upon examination, another examination two hours later will reveal if progress is being made. If no progress was made, call a veterinarian.

If the cervix is open wide enough to admit the hand, check to see that the kid is presented normally and if it is alive. If the kid is in the right position, withdraw the hand and let the doe do her job. If stronger labour does not come on within a couple of hours, or if the fetus does not move or give signals it is alive, consult a veterinarian.

Once the doe is straining intensely, a kid should be produced within half an hour. If nothing is showing after that time, check to see that the kid is presented properly. The doe may simply need more time than others do, so leave the doe alone if there is no evidence of a malpresentation. If the doe is obviously pushing and the cervix is not open, call a veterinarian immediately.

If the kid is not in a normal position, you may have to straighten it out before the kid can be delivered.



Breech presentation – manipulation is required to bring the kid into the delivery position. Apply traction to pull the kid out fairly quickly before it drowns.

Do not spend too much time trying to do the impossible inside the doe – sort out quadruplets or whatever. If you can't accomplish anything in 15 minutes, chances are you are doing more harm than good. Get out, wash up and call the veterinarian.

A caesarean section (C-section) is an operation to remove the kids from the uterus surgically. The veterinarian will probably use a local anaesthetic, then cut the doe open through the side and remove the kids. If the operation is performed before the doe is exhausted, and if the malpresentation was not due to a dead kid, the doe has an excellent chance of recovery and the kids should be perfectly fine. Some producers cull any doe that requires a C-section, but most does kid normally in years subsequent to a C-section.

If you assist the doe by entering the birth canal without proper hygiene, it is recommended that she be treated with systemic antibiotics for several days afterwards. An obstetrical bolus can be left behind in the uterus, but it is usually expelled with the afterbirth. If an infection does occur (see metritis), signs such as off feed and fever will usually show up within three weeks.

Fostering Kids

Hungry, orphan, rejected or excess kids can be "grafted" onto other does by following these steps:

- Watch for a doe that is kidding with a single kid. (Afterbirth will be delivered after kid is born).
- Remove the doe's own kid after colostrum feeding. Blind-fold the doe and manually check for a second kid using aseptic procedures. Allow uterine contractions to push your hand out.
- Place foster kid, feet tied together, in pen beside doe and rub generously with birth fluids from the doe. Remove her blindfold.
- After a while, when the doe is nuzzling and licking the kid, partly remove the kid's hobbles to allow it to get up and nurse. Once the doe has fully accepted the nursing foster kid, her own kid may be returned to the pen.

Care of the Doe After Kidding

Most does take an immediate interest in the kids, cleaning them off and urging them towards the udder as soon as they can stand. The exceptions to this will be young or very nervous does that do not realize what is happening. Isolate these does with their kids and once the kids have had a good feed of colostrum, leave them undisturbed as much as possible. When it is obvious that a doe is not accepting or feeding the kids, you may have to give them more help. Because poor mothering ability is heritable, you may want to cull the doe and the kids if there is no excuse for the failure to mother. Many hours can be wasted mothering-up kids, usually at a busy time of year, so the fault can be costly.

After kidding, a large drink of warm water will help the doe to re-hydrate and overcome the stress of giving birth. If you intend to milk her, you can lead her to the milk stand and give her a small portion of grain while you wash the teats and milk out a token amount of colostrum. (Colostrum may be frozen for later use if you wish.) It is more important that she accept the milking routine right away than that she get a grain ration. Do not milk her out completely until three or four days after kidding.

If the doe is not to be milked, a small handful of grain may be offered for its energy and taming qualities. All fresh does need good quality, palatable hay. If possible, start with the good hay she was getting before kidding, increasing the proportion of higher-protein legume hay each day. To prevent digestive upset, cut back on the grain for a few days, then carefully increase the grain ration. Be sure the doe has access to salt and minerals if they are not supplied with the grain.

An injection of vitamin A and D will help the doe to come into her milk. If you have not wormed the doe in the past month, do it now.

Raising Kids

Disease Prevention

Navel Dip

As soon as the kid is born it is exposed to a world full of micro-organisms. One way micro-organisms enter the kid's body and cause disease is through the navel, which is directly connected with the kid's blood stream. Dipping the navel stump in iodine/alcohol solution prevents that tissue from transporting bacteria and viruses into the kid's bloodstream.

Clean Environment

Another major route of infection is through the mouth. Manure is the most common contaminant in the birth environment. Fortunately, the manure of a healthy doe is fairly dry, and very few pellets will stay on top of a good fresh bed of straw. If the doe has been lying on damp, manure-filled bedding she will be carrying fecal material on her hair and teats, so the kid can be taking in disease organisms with its first feeding, before the colostrum gives it any immunity to fight disease. Cleanliness in the kidding area is vital to the health of the kids.

Dip the kid's navel in an iodine solution as soon as possible after it is born. Put the solution in a small jar, dip the navel into it and press the jar tight against the belly, then turn the kid upside down.

Navel dip

Colostrum

Colostrum provides a kid with a ready-made defence against most of the disease organisms the mother has been exposed to in her environment. A kid, depending on size, should receive 75 to 150 ml of colostrum at least four times in the 24 hours following birth. Colostrum may be frozen, then thawed and fed to kids when the dam's supply is short. Colostrum from an older, healthy goat is usually of the best quality. An alternative is to use colostrum from sheep or cows, which is also effective. Commercial colostrum substitutes have very little real value in preventing disease.

Vitamins and Selenium

An injection of vitamins A, D and E shortly after birth helps to prevent disease and infection. On the recommendation of a veterinarian, you may also inject a vitamin E/selenium preparation at this time to prevent white muscle disease. Also consult with a veterinarian about the need to vaccinate kids (especially those from unvaccinated does) with a multiple clostridial vaccine as early as seven to 10 days of age; most veterinarians do not recommend these vaccinations before six to eight weeks of age for kids from vaccinated dams.

Managing Kids

In a Commercial Meat Herd

Kids in a large meat herd are usually raised on their dams. Once kids and does are bonded and kids are strong, they may be moved to larger communal pens with other does and kids.

Ensure the water supply is clean and accessible to kids. If it is too high for three-week-old kids to reach it, provide blocks for kids to step on with their front feet so they can drink comfortably.

Although kids may be encouraged to eat solid feed by following the example of their mothers in the adult feeders, faster gains may be obtained if kids are given access to their own creep pen at all times.

In a Small Family Dairy

Kids kept in the herd as replacements should be removed from the dam at birth. Dairy goats are very slow to wean their kids and occasionally a yearling milker will still be allowed to nurse, which is inconvenient for a producer who is counting on the milk from both of them. Most kids that will be used as dairy replacements are not allowed to nurse at all. Instead they are fed heat-treated colostrum and pasteurized milk, or cow's colostrum and milk. Either type of milk may be mixed with or replaced by a commercial lamb or kid milk replacer after the first few days. This method of rearing is effective for controlling caprine arthritis-encephalitis.

If kids are to be sold for meat, the small-scale producer may choose to leave them with the doe to relieve himself of some of the milking chores. If milk is required, the kids can be separated for 12 hours or so per day after a week of age. This is an excellent way to introduce kids to solid feed. Pen the kids securely and milk the doe, being sure to use a teat dip after milking. Milk the doe again before returning the kids. While they are with their mother, kids may be allowed free access to the creep area, which is called a creep pen.

Dairy kids can often be purchased cheaply and raised by hand. Kids can be kept in small groups of ten or less and fed twice a day with a high quality milk replacer or either goat or cow milk. To encourage kids to eat solid feeds as soon as possible, offer high quality hay and a starter concentrate by five days of age. Kids can be weaned when they are eating sufficient hay and concentrate — about 200 g of dry matter per day.

During the first six weeks, kids can be offered:

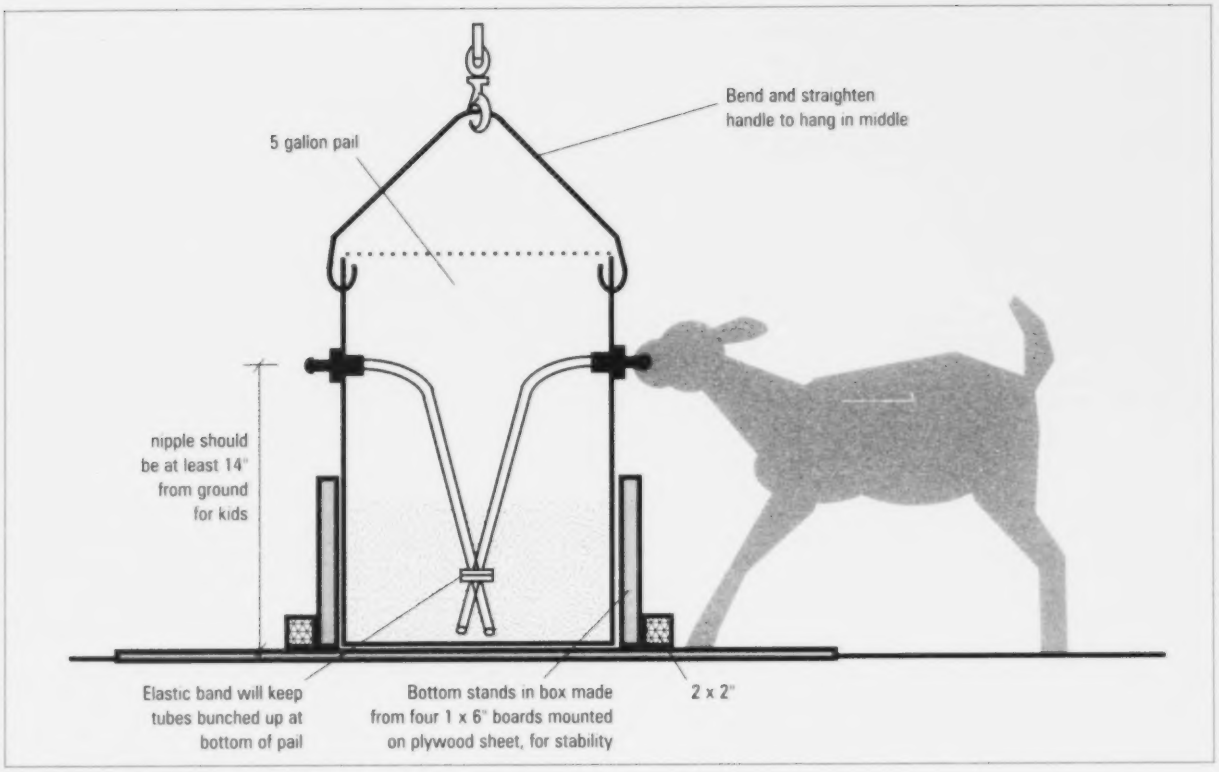
- One to three litres of cold milk or milk replacer daily, in two feedings or ad libitum (acidified)
- Alfalfa hay ad libitum.
- Free choice trace mineralized salt with coccidiostat
- Starter ration: a high protein (18 - 22 per cent), non-urea mixture can be fed ad libitum until kids are well started, then protein content may be reduced to 16 per cent for growing. If prepared by a feed mill, the starter and grower rations may incorporate any salt, minerals and coccidiostat that the kids require.

Meat kids can benefit from rations that are high in energy and protein, and if well started on such solid feed they will continue to grow well even after early weaning at five or six weeks.

Milk Feeding Equipment

Milk feeding systems vary according to the needs and preferences of the producer. A nipple pail or trough will be needed when more than three or four kids are fed at a time, or a nipple bar can be built to feed 20 kids or more at a time. Some producers prefer to feed milk from a pan or trough; they feel sanitation is simpler and the kids do not appear to have any problem with digestion.

A nipple pail will feed up to ten kids at a time. Milk may be kept cold with plastic ice bags in the milk or kept thawed using a heat lamp placed securely above it. Kids may be allowed to feed ad libitum, although this is not recommended with warm milk.


Bend and straighten handle to hang in middle
5 gallon pail
nipple should be at least 14" from ground for kids
Elastic band will keep tubes bunched up at bottom of pail
Bottom stands in box made from four 1 x 6" boards mounted on plywood sheet, for stability
2 x 2"

Nipple pail for feeding milk to kids

Creep Pens

This area must be inaccessible to adult goats, with pen walls at least four feet high and all fence spacing too small to allow the smallest yearlings to pass through.

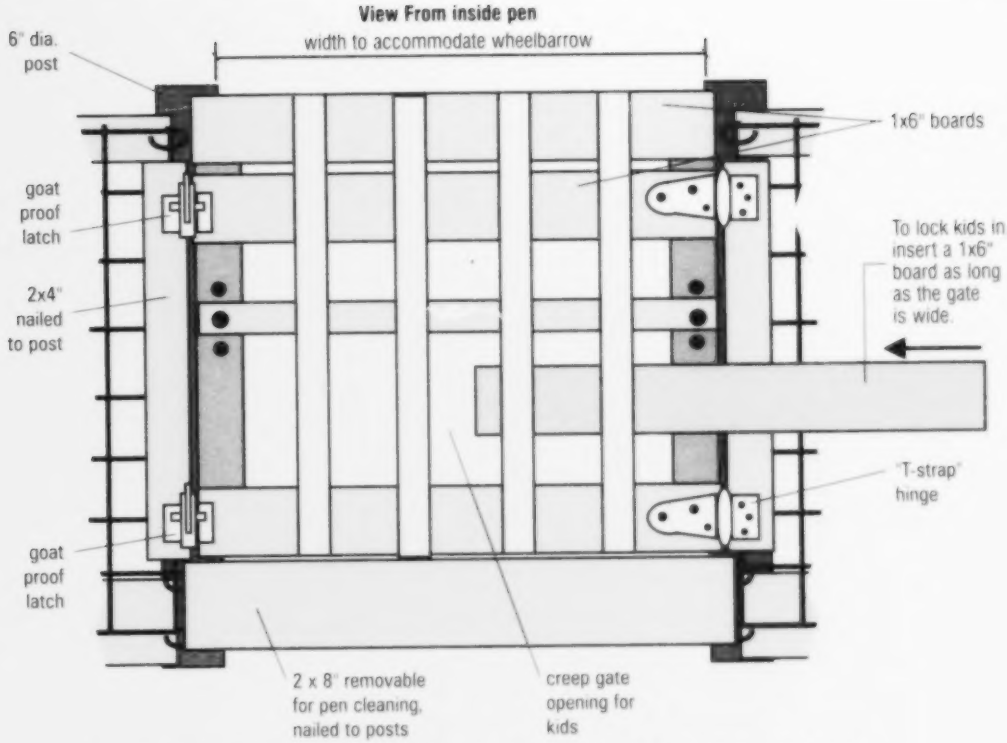
It is best to locate the creep pen in an area where the herd customarily lounges and rests. This may be an area of the barn under shelter, but if it is outside, kids should have a roof over feed supplies and, if possible, over themselves while feeding.

During the separation, the kids must have fresh water available. Offer free choice soybean meal, canola meal or a high-protein creep ration at first. Later mix the protein with grain or concentrate after the kids begin to eat small amounts of feed. Trace mineralized salt, preferably medicated with a coccidiostat, may be mixed into the concentrate or fed free choice.

The creep gate opening may be changed by moving the middle boards sideways or up and down. The opening required is very small; an opening 6 inches wide by 10 inches high will allow passage of kids up to 20 kg. Before putting grain in the self feeder, be sure yearlings and older kids on restricted rations cannot enter the creep area.

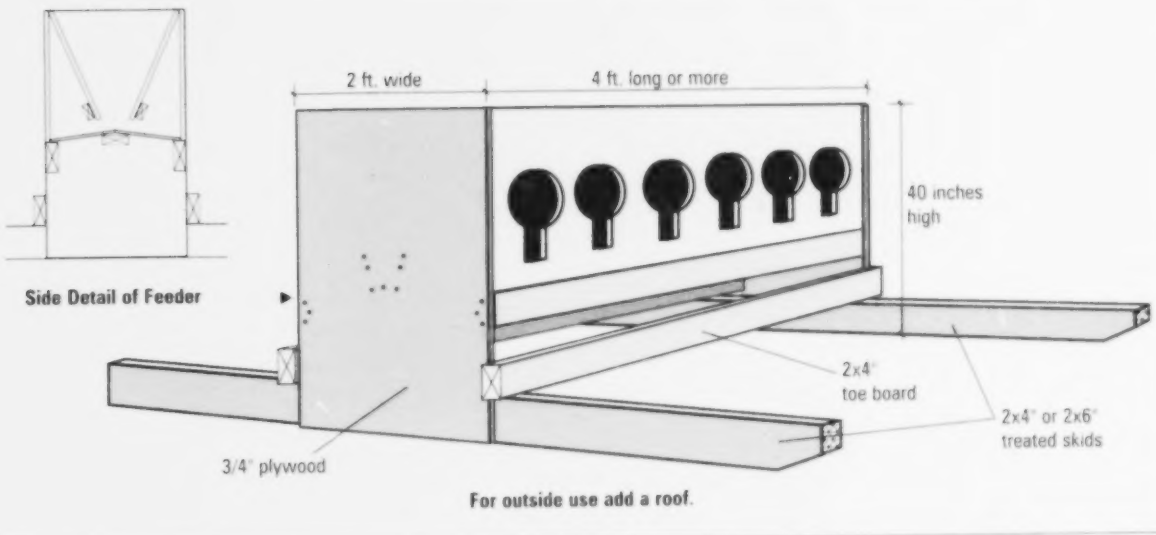
Disbudding

Opinions vary on whether goats in a commercial meat goat herd need their horns or not. Horns may injure herdmates or humans in close quarters or intensive settings, but in extensive settings, where the goats spend most of their time on pasture or in large lots, horns may be of little danger and may even be desirable. Horns on Spanish goats that produce a lot of cashmere are best left on for grooming purposes. If the choice is to raise goats without horns, kids should be disbudded shortly after birth. The kid will experience some pain when it is disbudded, but the pain is quickly forgotten and may save the animal from suffering in the future.


View From inside pen
width to accommodate wheelbarrow
6" dia. post
1x6" boards
goat proof latch
To lock kids in, insert a 1x6" board as long as the gate is wide.
2x4" nailed to post
"T-strap" hinge
goat proof latch
2 x 8" removable for pen cleaning, nailed to posts
creep gate opening for kids

The creep gate opening may be changed by moving the middle boards sideways or up and down. An opening 6 inches wide by 10 inches high will allow passage of kids up to 45 lb. Before putting grain in self feeder, ensure yearlings and older kids on restricted rations cannot enter the pen.

Creep gate for kid goats



Grain self feeder for kids

Do not attempt to disbud a kid that is not feeling well. The best time to disbud is when the kid is between three and 10 days of age. If the kid is hand raised, time disbudding for at least an hour after and two hours before milk feeding.

Before disbudding a kid, be sure it will have horns. The skin over a horn bud is tight on the skull; the skin in the same area on a naturally hornless (polled) kid will move freely. The hair pattern will also be different. A polled head usually shows a centre swirl of hair, the horned head having two curls over the horn buds. Polled kids develop an elongated bump on either side of the forehead, but the skin still moves freely over these bumps. Many Alpine kids, bucks in particular, are born with unmistakable tiny horns. Horns usually grow more slowly on Nubian kids.

An electric disbudding iron works well, but a short piece of heavy copper pipe may be held in an insulated grip and heated with a torch to produce the same effect. Heat the iron (or pipe) until it will burn a complete circle when tested on a piece of wood. If the iron is not hot enough, it will take longer to do the job and do it poorly.

Many people clip the hair over the horn buds, but others with a large number of kids will simply apply the iron directly to the bud, hair and all. The hair smells terrible when it burns and cools the iron slightly, but hair does not interfere if the iron is placed on the right spot. If horns are more than 2 cm long, they can be cut off first with a knife then cauterized by rolling the iron on the stump; the area to be burned will have to be larger than if the disbudding had been done in the kid's first week of life.

Hold the iron on the horn bud for 5 to 10 seconds, just until the proper degree of burn is attained. Do not apply much pressure with the iron. The skin of the horn area must be copper-brown or showing white bone to ensure that it will not develop into scurs or horn tissue.

Buck kids may be at least partially de-scented by burning the skin behind the horn buds where most of the scent glands are located. A larger horn bud area needs to be burned on bucks than on doe kids, but be sure to leave a strip of unburned skin down the middle to help the burns heal more quickly.

After disbudding, suckling kids can be released to their dams. Bottle-fed kids should be given warm water rather than milk, or they may go into shock. The warm water will comfort them without putting a strain on their digestive system. They may have a regular meal after two hours.

Check the kids' heads at eight weeks of age; if there are any scurs (misshapen horns) growing, cut them off and burn the area around them.

A. Hair pattern of horned kid

B. Check that skin does not move over horn

C. Clipping of hair optional

Disbudding

Identification

To avoid mistakes, identify kids as soon as possible after birth. See the section on Record Keeping and Identification systems.

Castration

If kids are to be castrated using rubber elastrator rings, this must be done before the kids are a week old. Be sure both testicles are in the lower part of the scrotum, and that the teats are not included when the ring is snapped into place. Any method of castration increases the risk of tetanus occurring. If kids have received colostrum from a doe recently vaccinated with a clostridial vaccine containing tetanus, they will have some immunity to tetanus.

Burdizzo clamps crush the cords that transport semen as well as many blood vessels supplying the testicles. This procedure should be done at less than three months of age. Do each side separately. Apply the clamp between the testicle and the body (again, keep the teats out of the way) and crush down for a good "crunch." There may be some swelling for a few days, but within a couple of weeks the testicles will shrink noticeably if the operation was successful.

Castration may be accomplished simply with a sharp knife up to about five months of age. Wash hands, knife, and the kid's scrotum with a disinfectant solution. Cut off the bottom third of the scrotum with a quick slice, reach up and locate the testicles. Cut them free of the membrane covering, peel the membrane back and pull the testicles out one at a time. Use the flat of the knife to scrape the cords as you pull them apart.

Be sure the scrotum is open to allow for drainage. While it is still healing, keep the kid and his bedding clean and dry. Protect the kid from flies and other stresses.

A. Cut off lower third of scrotum

B. Pull testicles free, pulling cord apart.

Castration

Health Problems of Kids

The following information is presented for orientation purposes. You may want to consult your veterinarian for a medical approach.

Hypothermia

A kid may become hypothermic if it is born weak or the dam does not lick the kid to stimulate it, particularly in cold weather. Hypothermia occurs when the body temperature is below normal (38°C). When this occurs the kid will be semi-comatose, limp, and most likely unable to suck. If you find a kid in this state, check to see that it is alive. Tickling inside a nostril with a straw will usually provoke a reaction in a live animal. Then take the kid's temperature, which will help you decide what action to take. In all cases, covering the kid with warm towels helps to increase body temperature.

The following are the three clinical stages of hypothermia, along with the procedures and chances of hypothermic kids recovering from each.

Moderate Hypothermia – Temperature 36 to 38°C; kid less than five hours old.

The kid will still have some energy reserves. Towel dry it vigorously. Encourage it to suck, but if it won't, feed 50 ml of colostrum by stomach tube at two hour intervals.

Serious Hypothermia – Temperature less than 36°C; kid less than five hours old.

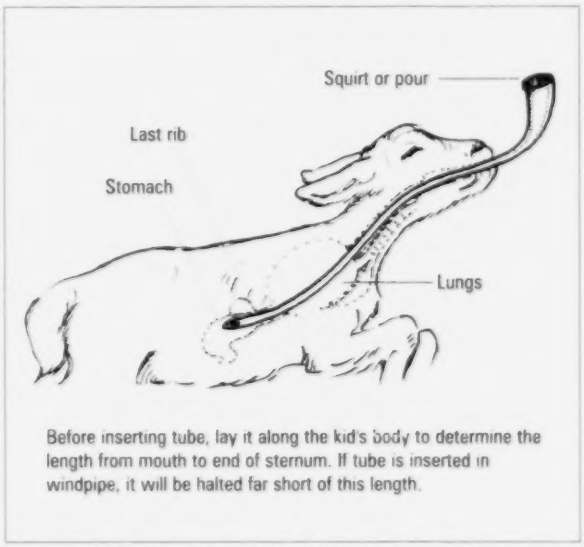
Warming must be more rapid. Plunge kid into warm (39°C) water, keeping its head above water, or use a warming box. The air surrounding the kid should have a temperature of 36 to 39°C. A higher temperature can cause fatal hyperthermia, from heating too quickly. When the kid's rectal temperature has reached 37°C it should receive colostrum, as discussed before.

Very Serious Hypothermia – Temperature less than 36°C; kid over five hours old.

This kid has likely used a large proportion of its energy reserves and is hypoglycemic (low blood glucose). It should again be towel dried but subsequent heating without glucose administration can result in death from a lack of glucose available to the brain. Warm (39°C) glucose solution can be administered, but scrupulous attention to cleanliness is essential.

The glucose dosage is 10 ml per kg body weight of a 20 per cent glucose solution (40 per cent solution diluted 1:1 with boiled water). Use a sterile syringe and new, one-inch x 20 gauge needle. The kid is suspended by its front legs with the needle entering a scrubbed area of the abdomen (intraperitoneal) one cm to the side and two cm behind the navel, aiming (at a 45° angle) toward the kid's rump. An intramuscular dose of antibiotic will help prevent infection.

Glucose can be given subcutaneously but absorption into the blood is somewhat slower by this route. If this route is chosen, distribute the dose over two or more sites, preferably under the loose skin behind the front legs or ahead of the hind legs. Injections under the tongue are quickly absorbed. Again, absolute cleanliness is essential. Once the kid is warm (36°C), administer 60 ml of colostrum by tube (see figure). The chances of a complete recovery from very serious hypothermia are reduced.



Before inserting tube, lay it along the kid's body to determine the length from mouth to end of sternum. If tube is inserted in windpipe, it will be halted far short of this length.

Using a stomach tube

Starvation

Unless a kid receives colostrum within the first two or three hours of life, its body energy reserves will become critically depleted. The producer must ensure each kid is nursing its dam regularly and is accepted by her. If not, foster the kid onto another doe. Another alternative is to feed the kid by hand.

Starvation typically occurs during the first three days of life. A kid will be found standing with its head down, ears drooping, back arched, or it may be too weak to stand. The stomach will be empty; hypothermia may be a complication.

The kid must receive colostrum or milk by stomach tube if it cannot suck, and be kept in a warm spot until it recovers. When using colostrum, make sure that it comes from a doe that is free of diseases such as Johne's and Caprine-arthritis encephalitis (CAE), or that the colostrum is properly heat treated.

Neonatal Scours

Very young kids (under 10 days of age) may have a brief episode of diarrhea following excessive milk intake, but such dietary scours are not usually considered serious unless the kid goes off feed, appears ill, or the condition continues past 24 hours. These signs suggest an infection by bacteria or a virus, which can result in scouring with dehydration and death within a day or two if not treated. Treatment usually includes withdrawing the kid from milk feeding and replacing milk with a nutrient/electrolyte solution. Commercial preparations are available or the following solution can be made up at home:

- one package fruit pectin
- 15 g low-sodium salt
- 30 g baking soda
- one can beef consomme (284 ml)
- mix and dilute with water to total volume of two litres

Keep the solution refrigerated. Feed warm solution in place of milk to scouring kids until scours have stopped for 18 hours.

When returning kids to milk feeding, start with small amounts of milk given at frequent intervals, watching out for the return of scours.

Clean and disinfect the kidding pens and newborn kids' quarters.

Consult your veterinarian about scouring kids. If kid scours is an annual problem, a medical approach is preferred, which may require antibiotic therapy, preventative measures such as vaccination, and appropriate management practices.

Scours of Older Kids

If diarrhea occurs, take scouring kids off milk or replacer and feed electrolyte-nutrient solution while treatment is being attempted. At three to four weeks of age, coccidiosis should be considered as a possible cause of scours. After four weeks of age, worms may be added to the list of possible causes. Do not treat kids over 10 days of age with oral antibiotics except on the advice of a veterinarian.

White Muscle Disease

This disease occurs as a result of a selenium deficiency in the diet. It is seen most often in growing kids. Affected animals may appear to be stumbling and uncoordinated. As the disease progresses, the hind limbs become paralyzed. If the heart muscle is involved, the first sign may be death.

Test your feed if white muscle disease is suspected. Treat animals showing signs of disease with selenium injections, and ensure the feed contains adequate levels of selenium by adding the mineral in the concentrate or salt mixture.

Navel Ill

Navel ill is an infection that occurs at birth, although the effects may not appear until months later. The infection may enter through the navel, and is characterized by sudden development of fever, depression, lack of appetite, and often heat and swelling of the joints of the legs. Even if treated successfully, the condition may become chronic and reoccur throughout life. Consult your veterinarian on the treatment of this disease.

Coccidiosis

Coccidiosis is one of the most insidious profit-grabbers in any goat operation. The signs are diffuse and difficult to spot without previous experience with the disease. Preventing the clinical disease depends on good management to reduce the number of parasites in contact with the kids. Medications introduced in the last few years have made the task easier.

Most adults are immune to the parasite but shed oocysts in their feces. The new-born kid, however, has no such immunity. Kids nursing their dams pick up coccidia in the first day or so. Although the clinical condition rarely flares up while the kid is nursing, it can still limit growth rates. When the kid is subjected to stress, the coccidia take advantage of the opportunity to multiply, causing coccidiosis.

Goats with severe coccidiosis do not usually show the bloody or black diarrhea characteristic of coccidiosis in other species such as calves and chickens, until major damage has been done. Instead, they show signs of stomach ache, stop gaining weight, and become dehydrated. Some die without ever having scoured; however, most do scour, with the feces yellow to brown and often watery.

Eventually the infected kid will develop some immunity to coccidia, and the rate of multiplication of the parasite will slow. However, in an acute case, part of the lining of the gut will have been replaced with scar tissue and abnormal cells, which are inefficient at transporting nutrients. As a consequence the goat may be permanently stunted or unthrifty for some time.

Diagnosis

Once the first signs of coccidiosis are detected in a group of kids, the whole group should be treated. The signs are, in order of usual appearance:

- reduced growth rate
- decreased appetite
- hunched posture
- rough appearance of hair coat
- coughing, sometimes snotty noses
- grinding teeth as if in pain, or crying intermittently
- diarrhea

If no animals are obviously ill, subclinical coccidiosis should be considered with the following management conditions:

- slow growth of kids (underweight as per weight chart on page 40)
- crowded confinement facilities (0.3 - 0.5 m^2 per kid should be a minimum)
- leaky waterers, poor water supply to kids
- feeders that admit kids' feet to feed supply

If no coccidiostat is being used, the above conditions indicate at least a potential for infection.

Control and Treatment

One approach to coccidiosis control is to feed a coccidiostat in a salt/mineral mix or concentrate ration. A coccidiostat does not kill coccidia, but it does at least partly prevent the establishment of the disease condition by limiting the rapid reproduction of the parasite or its entry into host cells. Resistance is eventually built up by the animal through constant exposure to a few coccidia.

If mild symptoms are observed, the drug Amprolium is very effective at reducing coccidia numbers. Dosages for kids range from 20 to 50 mg of Amprolium per kilogram of bodyweight per day, which may be added to the kids' milk or squirted down their throats individually. It can also be supplied to weaned kids by making sure their entire water supply is medicated at the rate of 12.5 per cent (directions on bottle) for five days. Longer periods of medication are not recommended because the drug may destroy thiamine in the digestive system, causing polioencephamalacia.

If symptoms are more severe, such as diarrhea, several of the sulfa drugs may prove effective. Consult your veterinarian.

Maintain kids on coccidiostats at preventative doses until they are well past weaning (four to six months old) and have developed their own immunity.

Coccidiosis Control Through Management

No coccidiostat will prevent all cases of clinical coccidiosis. Management plays a vital role in preventing outbreaks and losses. Be prepared to treat kids which show symptoms during periods of warm, wet weather, at weaning, changes of feed, shipping or when they are suffering from any other disease or stress.

If kids will be raised with their dams, the dams should be fed a coccidiostat in their salt for two or three weeks before kidding to suppress the coccidia in the environment. Most coccidiostats, however, are not approved for feeding to does producing milk for human consumption.

Use of these coccidiostats is an extra label use when given to goats. A veterinarian can prescribe their use for your herd.

Product	Rate	Comments
Monensin	Mixed into concentrate at 20 g/ton (1 mg/kg of bodyweight consumption).	Toxic if overdosed; has killed lambs. Very toxic to horses and most monogastrics.
Decoquinate	Premix mixed with TM salt at 1 kg/25 kg salt.	No toxicity reported. Very effective if fed from earliest days.
Lasalocid	Mixed with salt to provide 22 - 33 mg/kg of diet or 15 - 17 mg/ head day.	Mild toxicity at high overdoses, Toxic to horses. Very effective.

Keep kids' quarters clean and dry. Before moving young, susceptible animals into an area recently inhabited by older animals, remove all manure and dry the ground, in the sunshine if possible. Use hydrated lime to speed drying if necessary.

Do not crowd kids. After a year or two of expansion, it is tempting to cram more kids into a space designed for fewer. Baby kids need a minimum of 0.3 m^2 of shelter each; as they grow the space needed will increase. Outside play areas should be exposed to full sun and as well drained as possible.

Be sure the feed for kids stays as clean as possible. Hang feeders high enough so that the kids must reach up to eat by standing with their forefeet on a block or a toe rail. Immediately discard contaminated feed and salt. Waterers are a weak point; most parasites thrive in wet conditions. Be sure the water supply available is fresh and protected from feet and fecal material. Be especially careful to keep clean water accessible to kids during wet weather.

The same management that controls coccidiosis in a goat operation will also help to minimize infection by most other internal parasites.

Other Parasites

Kids are vulnerable to infection with other internal parasites passed in the adults' manure. Several species of worms attack the animal in different ways, all robbing the kid of nutrients. A program of preventive deworming may be necessary in intensive kid rearing situations. Consult with a veterinarian about fecal analysis and available treatments.

When does that are to nurse their kids are treated with an effective dewormer at kidding time and turned onto clean pasture with their kids, most parasite problems will be avoided.

Kids may also be affected adversely by heavy infestations of sucking lice, which will cause anemia. Infestations of chewing lice will cause discomfort and stress from lack of rest. If necessary, use an approved dairy louse dust such as rotenone (Dri-Kil®) at 17-day intervals for three treatments to rid the kids of lice.

Growth Rate

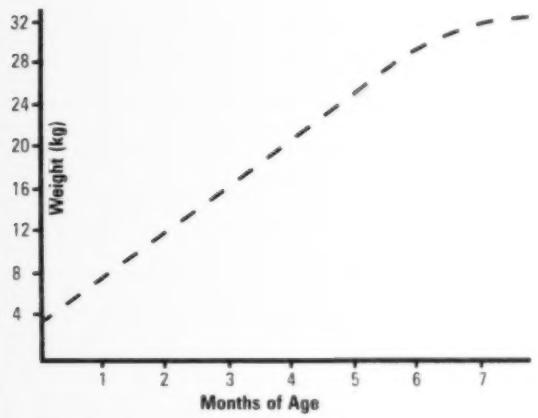
Healthy, well fed kids may be expected to grow from 150 to 250 g per day, or 5 to 8 kg per month.

Kids should be weighed monthly to be sure they are growing well. If weights are significantly less than expected at any stage of growth, the herd's management and nutrition practices should be re-examined.

A weight of 30 to 35 kg is considered the minimum at which a doeling may be bred for the first time. A goat should reach this weight by seven months of age. Certainly higher rates of gain and age-weights are possible in a well-managed herd with superior genetic stock.

At the 2006 Alberta Buck Test at Lakeland College, the average daily gain from July 10 to October 2 for 33 buck kids born from January to April 2006 was .58 lbs./day. The average birth weight was 10.25 lbs., the average on-test weight was 65.78 lbs. and the average off-test weight was 114.59 lbs., with an average weight gain on test of 48.81 lbs.

Minimum Growth Rate of Goat Kids for Meat Production or Breeding



Weigh kids regularly. "50-day" and "100-day" weights are indicators of valuable heritable traits. R.O.P. program will help determine relative value. Kids falling behind the average may have problems that can be corrected.

Keeping Goats Healthy

Controlling Disease

A few basic principles will help prevent health problems in the herd.

At Birth – The practice of removing kids at birth and using pasteurized-rearing programs is very important in preventing the transmission of numerous diseases such as Johne's, caprine arthritis encephalitis (CAE) and mycoplasmosis.

Heating the colostrum for one hour at 56°C has been shown to prevent CAE. Heat-treated colostrum can be stored frozen in small containers and thawed as required.

Nutrition – Healthy goats resist infection. Be sure your animals receive adequate fresh water, energy, protein, minerals and vitamins every day.

Sanitation – Excessive contamination of the environment will eventually cause even well-nourished animals to become ill.

Many diseases are carried in manure. If a deep bedding pack is used in the winter, the top layers must be kept clean and dry. As soon as feasible in the spring, remove the manure and allow the area to dry, with the aid of a layer of hydrated lime. Provide alternative shelter for the goats while their barn dries, or do only half the space at a time.

Remove dead animals immediately. If you do not send the animal for a post mortem examination, burn the carcass completely or bury it. If burial is chosen, make sure the animal is buried at least one m below the surface, so predators will not dig it up and drag it around. To reduce odour problems and discourage scavengers, cover the carcass with lime before covering it with dirt.

Most meat rendering plants refuse to pick up either sheep or goat carcasses for fear of scrapie. (Actually, goats almost never get scrapie although in rare instances goats raised in infected sheep flocks have been diagnosed as having the disease. However, this fact does not carry any weight with the rendering plants.) Therefore, the producer who has a large herd should make provision before freeze-up for the burial of animals that will be inevitably lost during the winter. A trench, dug in an area where the animals do not have access, and a good supply of lime should be sufficient.

The same advice applies to afterbirth: burn it or bury it.

Ventilation – Goats housed in enclosed buildings are prone to respiratory problems. Air-borne disease germs rely on dampness to survive. Condensation of moisture or frost on walls and ceiling of the barn signals danger. See the section on housing.

Isolation – Remove sick animals from the herd and prevent even nose-to-nose contact with others. New animals entering the herd should have separate quarters for at least a month while you observe them for signs of disease.

Observation – Know what your goats look like when they are well. An aggressive animal that becomes suddenly withdrawn could be in trouble. Goats should be enthusiastic about their feed; be suspicious of any goats that do not come running at feeding time. Watch for huddled posture, lameness, rough hair coat, staggering or listlessness in any individuals.

Check the home-based herd at least daily, more often in bad weather.

Medication – If you observe signs of disease, first try to find out what they might indicate. Consult books and friends, but mostly consult a veterinarian. If samples have to be sent to a laboratory to diagnose the problem, take the samples before you start any treatment, then start treating for the condition(s) that seem most likely.

Action – Tend to obvious problems as soon as you see them. Cleanse wounds immediately with mild disinfectant/soap and water solution. If a wound has to be stitched, it must be attended to within very few hours of injury. Do not use an oily or astringent preparation on a wound before it is stitched.

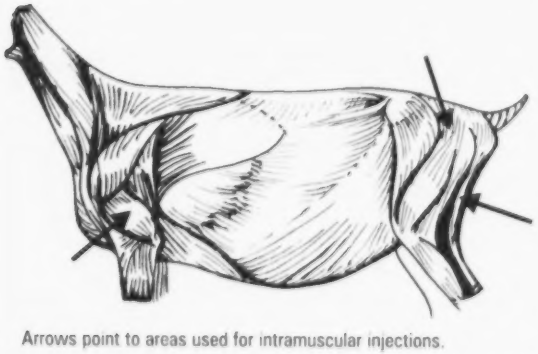
Any illness in the herd that is not attended to right away has the potential to affect many more animals.

Information – A veterinarian is a valuable resource; they know about the action of drugs, the process of disease, and many methods of treatment that may be unfamiliar to producers. As goats are ruminants, they are similar in many ways to sheep and cattle; dairy goats have many of the same problems that dairy cows do.

Literature on sheep and cattle is widely available. This can help a producer understand the workings of goats. Goat magazines carry articles of current interest about goat care, facilities, diseases and marketing.

Giving Injections

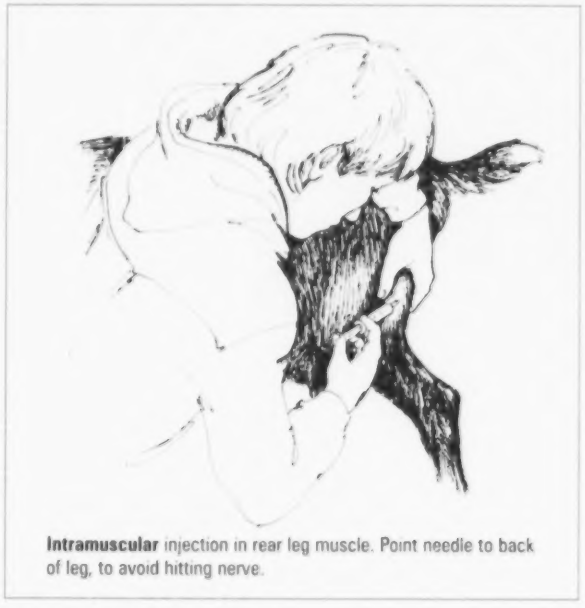
There are many reasons why a producer must learn to give injections. Unless he does, there will be the extra expenses of veterinary help for necessary and routine procedures.



Arrows point to areas used for intramuscular injections.

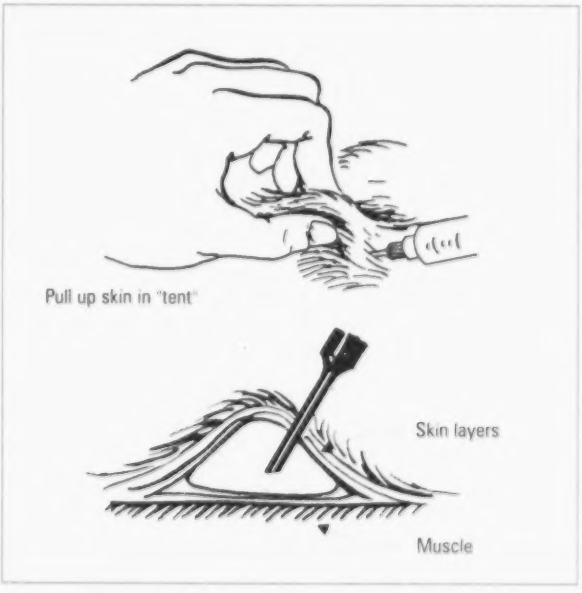
Muscles of a goat

Sanitary equipment and good hygiene are required when giving injections. Any time you make a hole in the skin, you risk introducing organisms that could cause disease. A healthy goat should be able to cope with a moderate number of most germs, but you can keep that number low only by practicing good hygiene.



Intramuscular injection in rear leg muscle. Point needle to back of leg, to avoid hitting nerve.

Intramuscular injections



Subcutaneous injections

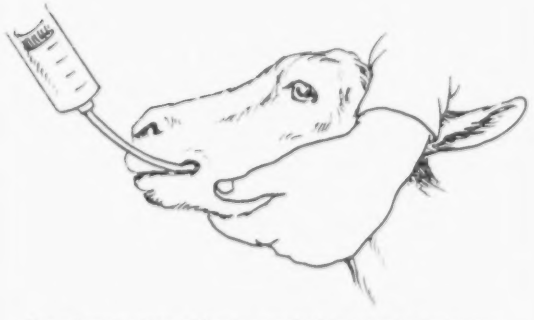
Ideally, a new sterile syringe and needle are recommended for each injection for each animal. However, meat herd managers may find, in the absence of specific disease concerns, that herd vaccinations will proceed faster with multi-dose equipment. If that is the case, always use new needles and replace them every 10 animals at most. Do not keep used syringes and needles around after the regularly scheduled vaccinations are administered; do keep a few extra new ones around for emergency situations.

Drenching

Occasionally a medication or a supplement will have to be administered orally in a liquid solution. A weak or newborn kid can be fed by stomach tube. An adult may have to be "drenched."

The problem with drenching is that fluid may be inhaled into the lungs and cause a type of pneumonia. If you are careful to keep the nose lower than the eyes while delivering the liquid, there is less danger of this happening.

Another way to determine if the tube is in the right position is by submerging the tip in a glass of water. If bubbles are coming out of the tube, it means the tube is in the trachea, and you will have to try again.



Use a large syringe with tube attached. Insert tube into corner of goats mouth to back of tongue, then depress plunger. Do not raise nose above level of eyes.

Drenching a goat

Hoof Trimming

Goats' hooves grow quickly on good feed and soft ground. Dairy does may need their feet trimmed every six weeks, although a meat doe on scrub brush pasture may need only two or possibly three trimmings a year.

Lack of attention to the feet of goats will result in lower production and more lameness in the herd.

When trimming hooves, restrain the goat as necessary. Goats hooves are usually trimmed while the goat is standing, so for the convenience of the operator the animal is often made to stand on a platform at a height comfortable for the person trimming the feet. The head is tied or held in a stanchion. The goat is further restrained by being squeezed up against a wall or board while the near feet are being trimmed, then it is reversed to trim the feet on the other side. Be careful not to pull the hind leg straight back and out, because a struggling goat may injure its stifle.

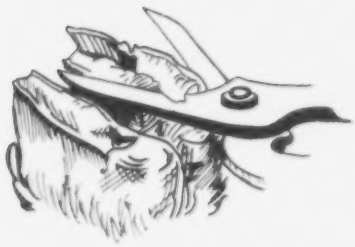
Founder, or laminitis, is usually a digestive problem that affects the feet. It is most common in fresh does being given high levels of grain, but may accompany mastitis or metritis as well. To prevent extensive damage to the hooves, treat any off-feed does with 200 ml of milk of magnesia and give prompt attention to disease problems. If abnormal hoof growth is observed within a month or so of kidding, frequent regular trimming may eventually bring the feet back to normal. Leave generous depth of sole on the foundered foot, but trim it so that the hoof walls bear the goat's weight.

How to Trim a Hoof

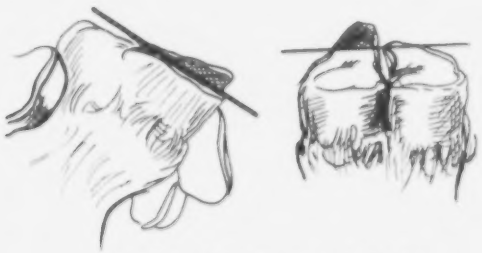
- Clean mud and manure from sole and sides of hoof.
- Remove flaps and obviously excessive hoof/horn tissue.
- Cut tip of toe vertical to ground to locate live tissue.
- Starting with the larger of the two claws, cut horn and excess soft tissue parallel to crown of hoof. Avoid cutting too deeply into the sole of the hoof. Take thin slices, trying to keep the entire bottom surface (sole and hoof wall) level.
- Pare the second, smaller claw level with the first. To check levelness, align toe tips or heels with a finger. The sole surface should be perpendicular to the line of the leg bone. Sight from heel to toe and from side to side to find bumps or deviations from each other in the two surfaces.
- If you are careful, there is no need for the goat to bleed. However, there may be an occasional mis-cut: use a disinfectant (e.g. copper naphthenate) on the wound and keep the goat on a clean, dry surface until bleeding stops.
- Check your work with the goat on a hard, level surface. Routine trimming will make trimming easier for you and your goats.

1. Clean out dirt.

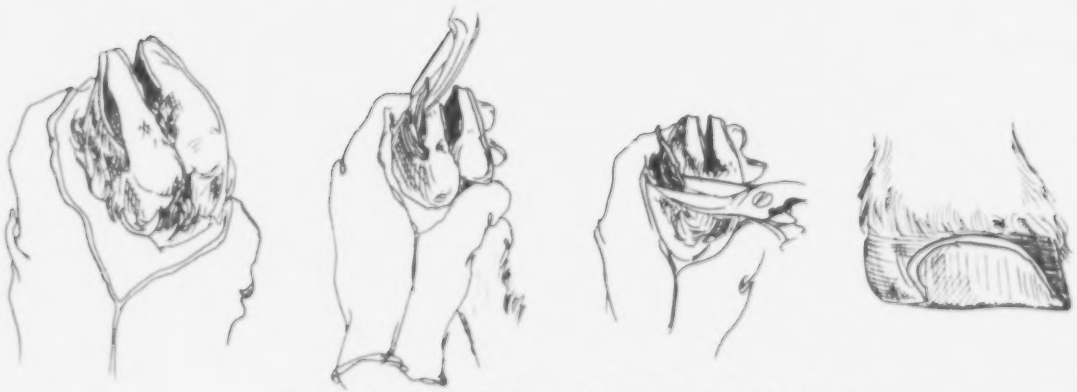
2. Cut off long toe.



3. Remove excess hoof wall.



4. Check levelness, trim high side.



5. If hoof wall is separating in spots, cut away outer wall over that area.
Apply copper naphthenate (KOPERTOX) to entire hoof afterwards.

Hoof trimming

Metabolic and Nutritional Diseases

Hypocalcemia (milk fever)

Hypocalcemia may occur before kidding, but usually affects does at kidding or shortly afterwards. The doe cannot absorb enough calcium from feed or mobilize enough from the bones to meet the sudden demands of lactation. It is more common in well-fed, high producing older does. The larger feto-placental unit present in goats, predisposes them to developing this condition during late gestation.

Signs

- The signs are similar to ketosis, but the onset is much faster. Other signs are rumen paralysis, anorexia and constipation. Unsteadiness progresses rapidly to an inability to rise, then coma and death within 6 to 36 hours. When this condition occurs during parturition it may impede the process of kidding; this is called uterine inertia.

Treatment

- Slow intravenous injection of 100 ml calcium magnesium glucose. Also, subcutaneous or intraperitoneal injection of this solution may save the doe. Give intravenous injections very slowly to avoid cardiac arrest.

Hypomagnesemia (grass staggers)

Hypomagnesemia most commonly affects lactating does grazing on fast-growing, lush grass pasture. It may develop suddenly or over two or three days.

Signs

- In slow-developing cases, hyper-excitability, stiff walk, frequent urination may precede acute signs.
- Acute signs: frenzy, convulsions, death.

Treatment

- Inject calcium magnesium glucose intravenously, subcutaneously or intraperitoneally to stop symptoms.
- Remove does from pasture, and feed them hay and concentrate plus 60 g of magnesium oxide daily for at least a week.

Ketosis (pregnancy toxemia)

Ketosis occurs in late pregnancy (last two to four weeks) in does that are in very thin or overfat condition and carrying multiple fetuses, or during early lactation for any doe. Ketosis is associated with greater energy demands from increased milk production and kid growth. As such, any condition that decreases feed intake may result in ketosis.

Signs

- Lack of appetite is the earliest sign.
- Later symptoms include: listlessness, isolation, leaning, progressive loss of reflexes, grinding teeth, blindness, incoordination, lack of appetite, convulsions and death.
- Breath contains ketones, which give a nail polish smell - ketones can be detected in urine with Ketostix™ or Keta-test™ tablets.

Treatment

- Drench twice a day with propylene glycol (150 ml) at the first signs of poor appetite in late pregnancy or the first month of lactation.
- More severely affected pregnant doe may have to be induced to kid or have kids taken by Caesarian section.
- Intravenous glucose (50 - 150 ml of 50 per cent glucose or dextrose) may help.

Polioencephalomalacia (polio)

Polio is caused by a deficiency of thiamine (vitamin B_1), probably due to rumen upset resulting from high concentrate feeding, lack of cobalt, etc. Prolonged Amprolium treatment will induce PEM; oral Thiabendazole and Levamisole may contribute to PEM.

Signs

- Signs include off feed, unsteadiness, staggering, apparent blindness, head pressing the wall, muscular tremors, convulsions, death.

Treatment

- Treat as an emergency. Fast action is required.
- Thiamine alone or in a vitamin B complex injected subcutaneously and intramuscular at 4 to 6 mg/kg (2 - 3 mg/lb) by each route.
- Reduce concentrate feeding and switch herd to good quality roughage for five days before returning to higher energy feeds.
- Administer B vitamins when treating animals for worms.

Urinary Calculi

Bucks and wethers eating high levels of grain are most often affected.

Signs

- Early signs include restlessness, twitching of the tail, straining – incomplete obstruction causes dribbling, blood-stained urine.
- As the blockage persists, colic-like signs develop: kicking at abdomen, rolling on the ground, rising and lying down frequently.
- Bladder becomes severely distended 24 to 36 hours after complete blockage.
- The urethra will often perforate if the condition is not relieved, allowing urine to leak under the skin of the sheath and belly, causing edema, or water belly
- In the most serious cases the bladder itself may rupture and release urine into the abdominal cavity. Peritonitis and death can result.

Prevention

- Moderate grain feeding and abundant water supplies for bucks will help prevent this condition. If urinary calculi has been a problem in the herd, a veterinarian may recommend routine feeding of ammonium chloride to bucks and wethers.

Treatment

- A veterinarian should be consulted immediately, as minor surgery will often prevent rupture of the urethra or bladder.

Digestive Problems

Diarrhea

For diarrhea in young kids, see raising kids.

Diarrhea in adults may indicate a recent digestive problem such as overeating grain or new lush forage. Remove animals from rich pasture and feed coarse hay, or feed less grain. If the condition persists, take fecal samples to your veterinarian to check for worm eggs and oocysts of coccidia.

Coccidiosis – Young newly-fresh does mixed with older animals or new arrivals in the herd may be subject to clinical coccidiosis. Treat with Amprolium or sulfas if necessary, withholding milk from human use as directed on the package. (See Raising Kids – Coccidiosis).

Johne's Disease – This disease may be a cause of diarrhea in older animals that have not been doing well. See Johne's disease. Diarrhea in goats does not usually appear until the final days of life.

Other Parasitism – The "spring rise" in internal parasite populations may be suppressed by worming at kidding time. But, when conditions are right, does can be carrying heavy burdens of parasites a month or two later, and diarrhea is one of the signs.

Treatment

- Prevent dehydration.
- Administer Kaopectate® or similar product to reduce diarrhea.
- Supply electrolytes depleted by loss of fluids, either by drench or paste.
- Keep fresh water available to animal at all times.
- Use appropriate treatment for diagnosed cause of diarrhea (wormer, sulfa, etc.).

Enterotoxemia (overeating disease)

Enterotoxemia may occur among young kids (from unvaccinated dams) consuming high levels of milk or eating a large amount of concentrate. Among unvaccinated adults, enterotoximia follows excessive grain feeding.

Signs

- Kids – Sudden death is often the first sign observed, but a kid may be off-feed, withdrawn and become unable to rise up three or four days before death.
- Adults – Weakness, incoordination, convulsions and possibly death occur within 24 hours.

Treatment

- No effective treatments are available.

Prevention

- Vaccination program – Administer two initial doses (8-Way®, Tasvax®, etc.) at a four week interval; with an annual booster given to does about four to six weeks before kidding. Kids from unvaccinated dams may be vaccinated starting at five to six weeks of age.
- Feeder kids – At the beginning of grain feeding period, vaccinate three times at two week intervals.

Frothy Bloat

Certain pastures, especially lush legumes, will cause frothy gas bubbles to form in the rumen, which cannot be eliminated by normal burping.

Prevention

- If goats must be turned out on rich pasture, feed grass hay first.

Signs

- The left side of the goat will appear distended; if it does not cause discomfort, it may not be true frothy bloat but goat must be watched for early signs of illness.
- Further signs of trouble include: laboured breathing, excessive salivation, anorexia; rumen becomes enlarged and drum-tight; cud chewing ceases, mucous membranes are pale and bluish; staggering, vomiting, collapse. Bloating and death may develop within 30 to 40 minutes after entering pasture, but more commonly take several hours.

Treatment

- Use a commercial preparation such as Bloat-go® or Dioctol®. If no other medication is available administer 120 ml of vegetable oil by stomach tube or as a drench.
- If there is no improvement and the goat becomes critical, surgical intervention may be necessary. Pressure can be relieved by inserting a large gauge needle through the rumen wall. This is best performed by a veterinarian and is only done as a last resort as death from peritonitis is common after this procedure.

Overgrown Teeth

Signs

- Poor chewing; goat may drop excessive amounts of feed or may pack cud into the cheek pouches to protect cheeks, causing non-permanent lumps on the side of the face.

Treatment

- File molars with a tooth rasp; treat goat for two or three days with penicillin to prevent infection.

"Simple" Indigestion

Indigestion often follows a change of feed that occurs too quickly, particularly to a higher energy or protein level. It may also occur if urea is introduced.

Signs

- Depression, lack of appetite, pasty foul-smelling feces.

Treatment

- Rumen may be flooded with 5 to 10 litres of warm water or saline solution by stomach tube; massaging the rumen for 15 minutes or so may help.
- For overeating grain: 250 ml of milk of magnesia and 125 ml of mineral oil may help counteract acids and eliminate toxins.
- For overeating protein or urea: administer drenches of vinegar to lower rumen pH and inactivate excess ammonia.
- Consult a veterinarian for further treatment.

Note – untreated cases caused by overeating grain may develop founder (laminitis) with abnormal hoof growth.

Internal Parasites

Flukes

Flukes have never been much of a problem in Alberta, except in animals imported from other areas where the weather is milder and usually moister. If you suspect the problem, consult a veterinarian.

Gastrointestinal Parasites

Goats are extremely susceptible to worm infestations. In a "natural" state they would live a nomadic existence, on fresh pasture continuously, browsing shrubs a foot or more above the ground. As a species, therefore, they have little worm resistance compared to other animals. When goats are kept on the same pasture for months at a time, worm problems become evident.

In warm weather or conditions of heavy environmental pressure, young goats can show signs of infection at four to six weeks of age.

Adults usually carry small populations of worms to which they have developed resistance. There is some evidence that worm resistance is inherited, although it is primarily dependent on good nutrition and management.

However, even older animals are periodically very vulnerable to worms, especially at times of high production and stress. Early spring and kidding time combine to produce a rise in the number of active worms, and consequently of worm eggs in the feces. This is known as the "spring rise." Late summer pastures are usually heavily contaminated with worm larvae and there may be another bout of parasitism at this time.

Signs

- Signs of worm problems include loss of condition, rough hair coat, anemia, a drop in production or growth rate, and sometimes diarrhea. Diarrhea in adult goats is most often due to worms.

Diagnosis

- If worms are suspected to be a problem, fecal samples from some of the animals showing signs of infestation should be taken to a veterinarian for analysis. A low level of parasitism is normal, but your veterinarian will be able to tell if the worm population is getting out of hand.

Treatment

"Strategic deworming" usually involves deworming does at kidding time to give them a good start on their lactation. Keeping kids and adults separate reduces the risk of infestation, but difficult to implement in most meat goat operations. In general, younger animals are more susceptible to parasites and may require more frequent deworming than older animals. Bucks and dry animals may be dewormed at the same time to suppress the spring rise in worm activity. A second deworming would take place in late summer. Deworming goats just before they are taken off pasture will help get them in good shape for breeding in the fall.

Another approach is having frequent fecal tests performed and deworming only when the number of worm eggs becomes too high. If requested, your veterinarian can perform a more detailed fecal test to indicate which particular dewormer may be most effective. Although there are very few dewormers approved for use in goats, your veterinarian may prescribe any dewormer he or she thinks will help the problem.

Other drugs used to deworm goats include most of those used for cattle or sheep, with the possible exception of some organophosphates. As a veterinarian's prescription is required by law to use these drugs for goats, you should consult with her or him to determine which product meets your management and economic needs. Particular attention must be paid to the withdrawal times for slaughter animals and does producing milk for human consumption.

Worms may become resistant to almost any product if it is used for years. It is a good idea to keep in touch with your veterinarian and have regular fecal tests performed to determine when it is time to switch dewormers.

Pasture Rotation

This is a very effective method of reducing parasitism in the herd, thereby reducing treatments and the incidence of drug resistance of the worms. If worms are at a low level before goats are turned into the first pasture, and goats are moved and locked out of their old pasture every two to three weeks, parasitism should be minimal.

If kids are pastured with does, they may be "forward grazed" by allowing them a creep entrance into the next, clean pasture before it is used by adults. This will give them a chance at the choicest and least contaminated forage available. If a dog is used for coyote control, it should be in the kids' pen at such times.

Lungworms

Goats grazing in wet areas can become infected with *Dictyocaulus* spp. or *Muellerius* spp., which are parasites of the lungs.

Signs

- Signs of lungworm include harsh dry cough, runny eyes and nose, anorexia, weakness, and weight loss – a special technique is used to confirm lungworm larvae in feces, so ask the veterinarian to check specifically for lungworms.

Treatment

- Ivermectin does not seem to be very effective at killing Muellerius spp., but Oxfendazole (Benzelmin®) has been reported to be successful on both types.

Note – There may be some problems if massive numbers of worms are suddenly killed in the lungs; consult your veterinarian for an opinion. If extensive damage is done before the worms are killed, coughing may persist.

Tapeworms

Signs

- Mild unthriftiness, slower growth rate, lowered production.
- Goats develop resistance to tapeworms quickly, so they are not usually considered a serious problem.

Diagnosis

- Tapeworm segments appear in feces; check fecal samples with your veterinarian.

Treatment

- Ivermectin has no effect on the tapeworm; albendazole or sulfonamide are commonly used. A veterinarian must prescribe these dewormers for use in goats.

External Parasites

Lice

There are two main types: sucking lice that feed on blood, and biting or chewing lice that feed on the skin and cause itchiness and hair loss.

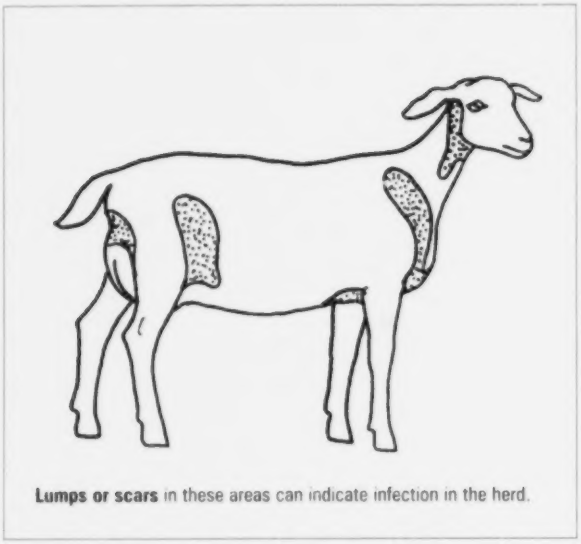
- Sucking lice are controlled by injections of Ivermectin but chewing lice are unaffected.
- Use systemic louse remedies only on the recommendation of a veterinarian.
- Dairy louse powders are safe for all goats, but must be used three times at exactly 17-day intervals (treat on Day 1, Day 17 and Day 34).
- No products have been put through the approval process for goats. Consult your veterinarian when selecting a product.

Infectious Diseases

Abscesses

The most common cause of abscesses in goats is the very persistent and insidious bacterium *Corynebacterium pseudotuberculosis (C. ovis)*, which causes a contagious disease called caseous lymphadenitis, C-L, or C.L.A, or "cheesy abscesses" of the lymph glands. These bacteria often enter the animal through the mouth, lungs or a wound, but also can penetrate healthy skin. They usually concentrate in lymph nodes where they form one or more abscesses. These abscesses are messy to treat and difficult to eliminate. This disease is the primary cause of goat carcass condemnation at the abattoir.

Caseous abscesses reduce the value of a goat



Lumps or scars in these areas can indicate infection in the herd.

Common sites of caseous lymphadenitis abscesses

Pus from these abscesses spreads the disease. The bacteria have a waxy coating which, in combination with the pus, helps them to live a very long time – up to several years – on wood surfaces or in the soil.

Prevention

- If any of the animals in the herd exhibit abscesses or the scars of abscesses in certain areas of the body, anyone with healthy goats at home would be wise to avoid buying animals from that herd. Not all abscesses indicate caseous lymphadenitis, but this is a wide-spread and serious problem in goats and should be avoided if possible.
- Even healthy animals from an infected herd can spread this disease. Isolate newly purchased animals from the main herd for 90 days and watch for signs.
- Do not allow abscesses to break open in common pens. Isolate animals with "lumps" before the abscess can break, and treat as directed by a veterinarian.
- Vaccinate kids and adults to help limit its effect on the herd.

Diagnosis

- If an abscess develops on any goat, the contents should be sampled and the organism identified by a veterinary laboratory.
- The pus is often quite dry – cheesy – but may not be as dry in goats as it is in sheep. The same bacteria cause the disease in both sheep and goats.
- The abscess has a very thick, fibrous capsule surrounding the interior where the bacteria live in the pus. This makes it impossible to kill the bacteria with systemic antibiotics.
- Infection of one lymph node may spread through the system to others in the body. Usually a goat will have one or more abscesses in a lymph node that is visible before the infection moves to internal nodes, but this is not always the case.
- Internal abscesses (in the lungs or around the gut) will cause wasting or sudden death of goats.

Treatment

- If you are really serious about eliminating the problem, cull rigorously for repeat offenders, or better still for any evidence of abscesses at all.

Abscesses – Other

Infection by other organisms will cause abscesses. Bacteria such as *Staphylococcus* or *Corynebacterium pyogenes* can gain entry through wounds and result in abcesses. These infections are not contagious. They may occur anywhere on the animal. A sample of the contents should be analyzed by the lab to determine the cause of the abscess. Some conditions commonly confused with abscesses:

Bottle Jaw – Severe parasite infestation or protein deficiency will cause anemia and edema in goats, often showing up as a swelling under the jaw.

Brachial Cyst – A cyst will occasionally form in a goat at the base of the wattle or where the wattle might have been. The contents will be a clear or cloudy fluid. This is not an infection.

Goitre – Iodine deficiency (not enough iodized salt, usually) will cause enlargement of the thyroid gland at the throat. Caution – do not confuse this with a common temporary condition in well-fed kids called thymus. Treating thymus as for goitre can result in iodine toxicity. Thymus regresses on its own as the kid matures.

Salivary Cyst – Another common location for cyst formation is in the salivary ducts on the side of the face.

Tooth Problems – Overgrowth of the sharp cutting surfaces of a goat's molars may lead to infection of the cheek lining. The goat may pack the cheek with cud to relieve the irritation.

Caprine Arthritis-Encephalitis (CAE)

CAE virus is passed through the milk to the kids, but does not usually produce arthritis symptoms until the animal is over a year old

Signs

- Enlarged knees in older animals may indicate the presence of this type of arthritis in the herd.
- Other signs appear earlier in life: on freshening the doe may have a hard udder that gives very little milk; kids can starve because of this severe edema.
- More rarely, a "brain fever," or encephalitis, will occur in kids of infected does, paralyzing the hind limbs while the kid remains alert and eating well.
- These conditions, together with the arthritis in later years, severely limit a goat's productive life.

Prevention

- The disease is passed to kids through colostrum and milk from an infected animal. A goat producer can break the cycle of infection by raising kids separately from suspected carriers and feeding them heat-treated colostrum and pasteurized goat's milk, or cow's milk and/or milk replacer.
- Meat producers may not find this as serious a problem as dairy producers. In a meat herd, kids are supposed to nurse only their own dam (although stealing is very common). If the dam is not infected, the kid will not be infected. Most kids are shipped for meat before symptoms develop. However, since the disease can limit the doe's milk production, kids may not grow as quickly on infected dams. Also, infected does may have a shorter productive life in the herd.

Chlamydial Abortion and Vibriosis

Chlamydiosis is the most common infection causing abortion in does. Symptoms are very similar in both diseases: the fetus is aborted in late pregnancy or kids may be born very weak. Some are born and recover. The doe rarely shows signs of illness. However, when signs are present does and bucks may develop pneumonia, keratoconjunctivitis, epididymitis and polyarthritis.

Pigeons and sparrows are reservoirs for this disease, and ticks may transmit it from these to sheep and goats. Once in a pregnant doe, the organism multiplies in the uterus and placenta after 90 days of infection. If the infection occurs at an earlier stage of pregnancy, does may abort late in that pregnancy. If exposed during the last half of gestation, does may abort during the next pregnancy. The organism is shed in large amounts in the placenta, fetus and uterine discharge. Immunity after an abortion lasts up to three years. The organism can persist in feces from infected animals, increasing the risk of contamination in the herd. These conditions are mostly venereally transmitted from bucks to does at breeding.

Bucks may carry the disease without showing any sign of the disease.

Once abortion has taken place, subsequent pregnancies are usually successful.

Chlamydial infections may be passed to humans in contact with aborted fetuses, infected kids, placental tissue or infected discharge, and may cause abortions in pregnant women. Be sure to wear protective clothing and wash these clothes separately; no pregnant woman should come into contact with any birth materials.

Diagnosis

- Gather up all the aborted material for laboratory analysis: fetus, placenta, membranes, uterine discharge. Wear rubber gloves, gather in a plastic bag that is turned inside out and sealed carefully.

Prevention

- Combined vaccines are sometimes available. Consult your veterinarian. Herds that have a history of these abortions will benefit from vaccination before breeding season.

Clostridial Disease

Clostridial disease organisms are found on all farms. The organisms are normally found in the intestinal tract of healthy goats. They only produce disease when stresses and nutritional conditions trigger their growth and multiplication.

Signs

- The toxins produced by the multiplying bacteria are released so quickly that often the first sign of clostridial disease is death.

Prevention

- Vaccination is the only effective means of dealing with these diseases.
- Two vaccinations administered four to six weeks apart will stimulate and establish the production of a high level of antibodies. An annual booster is required.
- Does immunized or boostered four to six weeks before kidding will pass antibodies to kids in colostrum.

Enterotoxemia (Overeating Disease) – Enterotoxemia can cause sudden death in the fastest-growing kids. Organisms multiply rapidly in the small intestine when high energy rations are being fed. Toxins are produced that often kill the animal.

Sometimes enterotoxemia takes a few days to kill a goat kid; off feed the first day, it becomes lethargic, recumbent, bloated; then body temperature drops and it dies. Antitoxin may be of some help in such cases.

Another form may attack goats of any age, especially those on high grain ration. Bloody diarrhea and central nervous system signs – stiff neck, head pressing, blindness – may accompany severe illness.

Malignant Edema – This clostridial disease can affect goats, through wounds or possibly through the udder of very fresh does lying in wet, filthy conditions. The organism settles in muscle tissue where it produces its poisons and kills the animal quickly.

Tetanus – This clostridial disease can affect any non-immunized animal or person, typically through a puncture wound. The signs may include excitement, rigidity and death.

Clostridial diseases can rarely be treated successfully. Heroic nursing may save an affected animal, but is rarely successful. The producer and the veterinarian may design a strategy to reduce and control clostridial diseases. This may include the use of vaccines.

Endometritis

Endometritis is an infection of the internal lining of the uterus following kidding, usually under stressful or dirty conditions. If the animal recovers from kidding without completely clearing the infection, it may cause infertility. On the other hand, when the infection progresses it may affect other layers of the uterus, causing metritis, which is a rare condition that may become systemic and cause death.

Signs

- Foul-smelling discharge, off feed approximately three weeks after kidding.

Treatment

- Consult a veterinarian about antibiotic therapy.

Foot Rot

Goats seem to be more resistant to infectious foot rot than are sheep, but they may carry it in overgrown feet.

Signs

- Infected pockets between hoof wall and foot will be very foul smelling.

Prevention

- Trim feet during spells of wet weather, and use copper naphthenate liberally.

Treatment

- A 30-minute foot soak in a 20 per cent zinc sulphate footbath may be required. Treat all animals in the herd. Turn goats onto clean dry ground after footbathing.

Johne's Disease

Bacteria responsible for Johne's disease damage the lining of the intestine resulting in a thickening of the intestinal wall. This results in a lessening of the amount of nutrients being absorbed, leading to a gradual wasting of the goat, despite a good appetite.

Johne's disease is spread to young stock through contaminated fecal material shed by carrier adults.

Signs

- Older (three years and over) animals will have been wasting for some time, in spite of an apparently normal appetite, before diarrhea is seen. Diarrhea is not commonly seen in goats. Clumpy feces is a more common sign. However, these signs may occur in the final days of the infection, just before the goat dies.

Treatment

- None.

Prevention

- Do not feed goats on the ground.
- Buy animals from herds with no history of Johne's infection.
- Separate earlier kids from does and use heat-treated colostrum and pasteurized milk from Johne's disease-free does. Use of milk replacers is another good option to hand-raise kids.

Listeriosis

Listeriosis can cause abortions. Another form causes "circling disease" – a small abscess in the brain will produce nervous symptoms, most often one ear drooping, the head pulled around to one side and consequently the goat moving around in circles. It may be preceded by diarrhea.

Treatment

- Large doses of tetracyclines may help if the disease is caught in the early stages.
- It may be a problem in herds fed grain silage. Remove the animals from silage and feed long hay.

Mastitis

Mastitis is an infection of the udder. There are many organisms that can cause varying degrees of infection, but the most important type of mastitis to concern the meat producer is clinical, where obvious changes in the udder and the milk occur.

Signs

- One or both sides of the udder become hot and hard. The doe will not allow the kid to nurse the affected side or, frequently, either side. Milk from the mastitic gland is lumpy or watery, and sometimes discoloured.

Treatment

- The kid should be removed from its dam and fed by bottle if necessary. The organism causing the mastitis may infect the kid's digestive system and cause problems.
- If the doe is not to be culled, the udder should be milked out completely and, using strictly aseptic technique, an approved mastitis treatment infused through the teat opening. Frequent stripping during the day with infusion at night may be necessary for several days. Systemic antibiotics (injections) may also help. Consult a veterinarian.
- Do not feed mastitic milk or milk from antibiotic-treated does to kids.

Pinkeye

Signs

- Excessive watering of eye(s). When eyelid is lifted, eye membranes appear reddened. The cornea may be milky white and ulcerated.

Treatment

- For individual treatments, various ophthalmic preparations may be used. They must be applied to the eyes of each goat two or three times a day.
- Pinkeye is often provoked by a vitamin A deficiency. If any cases are noted, herd vitamin A status should be assessed.
- If the condition persists as a problem, consult a veterinarian.

Pneumonia

Goats are very susceptible to pneumonia if conditions are damp. Pneumonia may occur in warm summer weather, or in winter if goats are too tightly housed.

Signs

- Runny nose, panting or fast, shallow breathing; body temperature rises dramatically, then falls to below normal. Once the animal's temperature has dropped, prognosis is poor.

Treatment

- Consult a veterinarian when choosing an antibiotic. If the goat shows no signs of improvement on a product, ask the veterinarian to prescribe another drug.

Ringworm

Ringworm is a fungus, not a worm.

Signs

- Round sores, usually on the face, which are crusty around the perimeter.

Prevention

- Wet weather and dirty bedding are the major reasons for ringworm gaining a foothold in the herd. Clean barn and yards regularly, lime and let them dry if possible before returning animals.

Treatment

- Several products (such as iodine, Ring-go®, etc.) applied directly to ringworm sites, then covered with mineral oil, have been successful. Some producers use mineral oil alone. Do not apply used machine oil because it contains poisons.

Soremouth (orf, contagious ecthyma)

Signs

- Most often affects kids, appearing as "fever blisters" around the mouth and nose. These sores may multiply and grow very large, crusting over and finally (after two to three weeks) dropping off.

Treatment

- The disease is caused by a virus, and there is nothing you can do to shorten the course of the disease. However, secondary infection can be prevented by using a wound spray on the lesions every day or so until they heal.
- If kids are nursing their dams, the greatest problem is that they may transmit the disease to the does' udders. This can lead to mastitis. If possible, separate affected kids from their dams.
- Be careful! Humans may contract this disease.

Toxoplasmosis

This is another abortion disease. Organisms may be shed in the milk and affect humans drinking unpasteurized milk. In humans abortion may not take place, but the fetus can be severely affected with resulting blindness, retardation or other birth defects.

Vaccines and Preventive Treatments for Goats

Antibiotic Feed Additives – Of questionable value; consult your veterinarian. Useful in some specific and very limited situations.

Caseous Lymphadenitis Vaccine – This vaccine is combined with two clostridial toxoids, but you may want to use Clostridial 7-way or 8-way vaccine as well. Useful in reducing the incidence of abscesses in infected herds. Kids should be vaccinated before exposure to abscessed animals. Kids should receive two doses followed by annual boosters.

Clostridial Vaccines – Immunize against tetanus and enterotoxemia, the two most common and deadly forms of clostridial disease in goats. Even if you have not yet had an episode of enterotoxemia in your kids, vaccination will protect them when they are sold (to a feedlot or a breeder) and undergo stress and a change of feed. Inject the vaccine subcutaneously behind the elbow. Administer two initial doses followed by an annual booster, 3-4 weeks before kidding in does.

Coccidiostats – Coccidiostats are very effective at reducing the pressure of coccidial infections in kids. Feed them in salt/mineral mixes or creep rations under the direction of a veterinarian.

Soremouth Vaccine – A commercial vaccine is not available, but a special vaccine may be made up for your herd using scabs from soremouth occurring in your herd. If soremouth is an annual problem in the herd, vaccinating does before kidding may prevent mastitis caused by soremouth transmitted to the udder by suckling kids. Most herds affected by the disease have a very low incidence for several years after.

Vibrio/EAE Vaccine – This vaccine is used only in herds with a history of late-term abortions, if either vibriosis or chlamydial infection have been diagnosed. Does are vaccinated before breeding. This vaccine is not always available, so consult your veterinarian.

Goat Zoonoses

Zoonotic diseases are those infections that are naturally transmissable between animals and humans. Of the several hundred zoonotic infections that have been described worldwide, only a small number affect small ruminants. Nevertheless, with the increasing interest in goats, there is a need to emphasize some specific zoonotic diseases. This is especially significant when children are in close contact with animals.

The most common zoonotic diseases of goats are listed below:

- orf (soremouth)
- caseous lymphadenitis (pseudotuberculosis)
- listeriosis
- vibriosis (campylobacteriosis)
- enzootic abortion (chlamydiosis)
- salmonellosis
- ringworm
- Q fever (*Coxiella burnetii*)
- toxoplasmosis

Because goats supply many products (meat, hair and milk) and may also serve as companion animals, in-contact people should be aware of the risks of specific zoonotic infections. If common-sense precautions are taken, however, goats should not pose a greater threat to human health than does any other species of livestock.

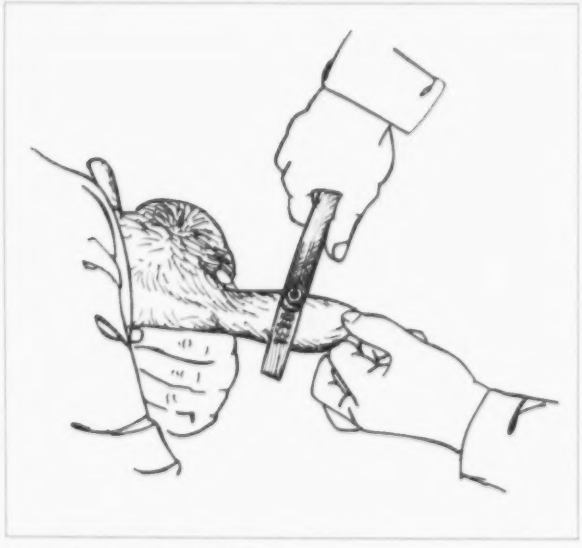
Record Keeping

A purebred livestock operation is legally required to keep accurate identification, breeding and sales records. Most producers find that more extensive record keeping is required.

Identification

Identification is the key to herd record keeping in any operation. In a meat herd, a system of identification helps the producer keep track of herd health programs and management indicators such as rate of gain, individual production and other genetic differences that guide culling and selection decisions.

Ear tags are a useful method of identification for meat goat herds. The small tags are preferred by most producers, who find that large tags catch on brush or are ripped out by other goats during feeding. The placement, colour and number on the tag may all convey information about the goat, which can be read at some distance.



Tattooing and ear tagging

Neck tags are convenient for animals in a feedlot, but can be dangerous in heavy brush. Temporary collars or leg bands can be used to keep track of identity of newborns in the kidding pens until more permanent identification can be applied.

Registered, recorded grade, and percentage grade kids must be tattooed for permanent identification. Most are tattooed in the ear, but LaMancha kids are tattooed in the tail web.

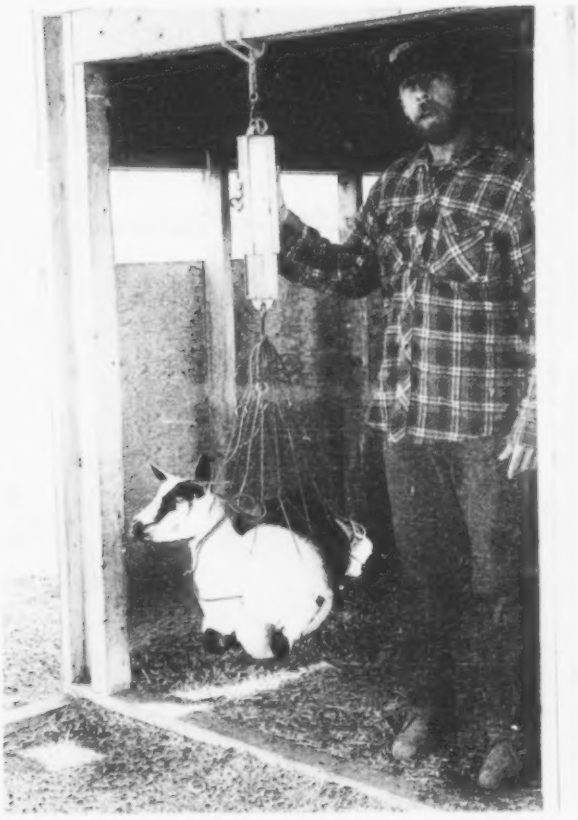
Equipment

Some simple equipment is all that is needed for a basic record keeping system, which includes a calendar, notebook, and pencil. Note future events on the calendar: kidding dates, booster shots, re-powdering for lice, etc., and post the calendar in a prominent place in the barn (out of the reach of goats). There or in the notebook write down any observations you make or any treatments you perform, giving the date and listing all the animals involved. Also in the notebook, list kids' ear tag numbers and colours, with dam's I.D. as you apply the tags. If you like, use a worksheet like the one included in this book for recording data on kids. It is a good idea to have I.D. information in more than one place anyway.

You will not remember I.D. information if you don't write it down immediately. When you have time, transfer the information onto individual cards or computer files.

A meat producer should have a scale for weighing animals; the capacity required will depend on the size of animal marketed. A sheep scale will weigh adult animals conveniently. Kids can be held in a horse's hay net, sling or a bag hung from a spring scale to determine weights under 50 kg.

If kids are weighed regularly, the producer will stay informed about his management. Growth will slow significantly and sometimes quite suddenly in kids with heavy parasite burdens or those undersupplied with any of the nutrients necessary for growth. By weighing kids often, problems can be corrected early.



A scale is needed for obtaining accurate weights

Health Records

Keep a card file in the stock medicine cabinet. File the literature you get with your medications; you will need them some day. Every time you treat a group or an individual:

- Pull out a file card and PUT THE DATE ON IT.
- Name the animal(s) treated; name the medication and or the brand; and give the dosages used in each case.
- If an animal or group is to be treated for several days, list the dates of treatment. Keep the card out and check off treatments as they are accomplished.
- If a treatment is missed, note the fact. In all cases, note what actually happened.
- In the case of a doe producing milk for human consumption, note the dates of milk withdrawal and check them off as they are finished. Allow extra time if goats are not mentioned on the label. Do the same for a meat goat destined for market.
- Before putting the card away, comment – how did the animal/group respond/look/behave? Even a note about the weather may be helpful some day.
- Then put the card away. Form the habit of putting the latest card at the front or at the back, whichever is easier for you, but be consistent.
- Once in a while, go back and review your file.

Individual Records

Your herd is composed of individuals. Those that perform better for you are the animals with the characteristics that will make you money. By keeping records on each animal and its progeny, you will be able to make more informed decisions.

Kid Worksheet

Ear Tag (I.D.)	Date Born	Dam	Sire	50-day Weight	100-day Weight	Date Sold	Weight	Price Received

Doe Record

Name of Doe ..... Born ..... I.D. .....

Breed/Markings ..... Horn ..... No. in Birth .....

Sire ..... Dam .....

Purchased from ..... Date ..... Price .....

Disposal: Date ..... Reason/Purpose .....

Date Bred	Buck	Date Kidded	No. of Kids	Ease of Birth	No. Kids Raised	Kids Sex	I.D. Number	50-day Weight	100-day Weight

Buck Record

Name of Buck ..... Born ..... I.D. .....

Breed/Markings ..... Horn ..... No. in Birth .....

Sire ..... Dam .....

Purchased from ..... Date ..... Price .....

Disposal: Date ..... Reason/Purpose .....

Date Used	Doe	Date kids Born	No. of Kids	Kids Sex	I.D. Number	50-day Weight	100-day Weight	Rate of Gain 50 - 100	Date Sold	Market Weight

Herd Production Records

Once a year, you should look at the results of your goatkeeping activities. By grouping concerns and calculating percentages, you can see where problems are developing and take steps to correct them. Some of the figures needed include:

- total does bred
- total does kidded – productive does for this year
- animals lost and why
- total kids born
- total live kids
- death loss percentage
- kidding percentage
- total kids weaned (or sold before weaning)
- weaning percentage
- dollar value of kid per doe

Doe Record

Number of does exposed to bucks and/or purchased bred: .....

Slaughtered or lost from production due to:

- pregnancy toxemia .....
- difficult kidding or infection .....
- spoiler udder, mastitis, no milk .....
- respiratory problems .....
- predators .....
- sudden death .....
- non-diagnosed .....
- failed to kid (open) .....

Total .....

Kid Record

Number of kids born, dead or alive **a.** .....

Losses:

- aborted .....
- difficult delivery .....
- starvation .....
- birth deformities .....
- accidental injuries .....
- weak .....
- predators .....
- causes unknown .....

Subtotal 1 .....

Diseases:

- pneumonia .....
- enterotoxemia .....
- white muscle .....
- tetanus .....
- coccidiosis .....
- scours .....
- other .....

Subtotal 2 .....

Total kids lost (subtotal 1 + 2) **b.** .....

Total live kids (subtract b from a) .....

Kid drop percentage (total kids born x 100) / no. of does .....%

Death loss percentage (b x 100) / a .....%

Total weaning percentage (total live kids x 100) / no. of does .....%

Financial Records

It is important for the farmer to record data, analyze the financial performance of the business each year, and compare this performance with results from previous years. Bookkeeping is essential. Certain information must be kept to make financial analysis possible. Records required to produce meaningful cost and return data include:

- annual inventory *
- kidding
- mortality
- feed use/purchase *
- sales and purchases of livestock and livestock products *
- internal transfers
- other goat related expenses *

* Also required for completing annual tax return

Livestock Sales, Purchases and Transfers Schedule

This chart has the following major headings:

Date – This is the date of sale, purchase or transfer. The transfer is an internal matter made by yourself. Therefore, the date should be when you consider the animal to have transferred.

Sales – Note down whether the animal sold was a breeding doe, breeding buck or buck kid, replacement doe kid or feeder kid (0 to 12 months old). Also, record the number sold, the average weight, the average price and to whom it was sold.

Purchases – Record this section the same way as you did the sales section.

Transfers – In this section, record from what type (e.g., breeding doe, breeding buck or buck kid, replacement doe kid or feeder kid), where the animal was transferred from and to. Also record the rest of the information as in the sales and purchases sections.

For most people whose herd kids once a year, the recording of transfers could be done at the end of the year (December 31).

General Comments – Note any comments as you see fit.

Livestock Sales, Purchases and Transfers Schedule

Month _____ Year _____

	Sales					Purchases					Transfers						
											Transfer						
Date	Type of Stock	Number	Weight	Selling Price ($)	Sold To	Type of Stock	Number	Weight	Purchase Price ($)	Purchased From	From	To	Type of Stock	Number	Weight	Market Value ($)	General Comments

Mortalities

On this form, record only the deaths.

Date – The date of the death.

Type – The type of goat (e.g., breeding doe, replacement doe kid, buck or buck kid, or feeder kid – 0 to 12 months old).

I.D. Number – Note the identification number of the dead animal if it has one.

Age – The age of the animal.

Weight – The weight of the animal.

Reasons – Your reason for the animal's death.

Post Mortem – If a post mortem was done, place the results of the post mortem in this column as well as the initials or name of the individual conducting the post mortem.

Mortalities Schedule

Year _____

Date	Type	I.D. Number	Age	Weight	Reasons	Post Mortem

Feed Purchase and Use Record

This chart has the following major headings:

Date – Date on which the feed was fed.

Type of feed – When recording the type of feed, note what you are feeding or will be feeding. Types of feed include: 1st cut hay, 32 per cent protein supplement, etc.

Type of stock using feed (breeding or feeder stock) – e.g., breeding does, replacement doe kids, buck or buck kids, or feeder kids (0 to 12 months old), etc.

Source of feed – The source of feed should always be recorded. If the feed was purchased, record the name of the seller. If the feed was homegrown, then that should be recorded as well.

Weight/volume – This column refers to the unit in which the feed is fed. This could mean square bales, round bales, bushels, tonnes, bags, etc. If the type of unit fed is not satisfactory, then use the type of unit that is easiest to record.

Price per unit – This is the price per unit fed, e.g., $2.50/bushel.

Total – This is the result when **weight/volume** is multiplied times **price per unit**. If feed is bartered or traded for something, then record the fair market value of the item.

Feed Purchase and Use Record Schedule

Date	Type of Feed	Stock Being Fed		Feed Source	Weight Volume	Price Per Unit ($)	Total ($)
		Breeding Stock	Feeder Stock	(home grown or purchased from ?)			

Marketing Meat Goats

Body Composition During Growth

At birth, only a small amount of fat is present in the kid's body, while its bones are fairly well developed. As the kid grows, muscle tissue is deposited at a rate in proportion to weight gain. Growth of bones is generally slower than that of the rest of the carcass. Fat is deposited more in late growth, first around the internal organs and finally subcutaneously.

The muscle tissue of goats is low in fat and high in water, protein and ash (Gaili *et al.*, 1972). A study by Sauvant in 1979 showed the fatty acid composition in the milk-fed kid depends on the fatty acid composition of the milk, and that an increase in the feed intake level tends to reduce the saturation of the fat tissue. The intramuscular fat does not change much after weaning, but the internal fat becomes harder (richer in stearic acid, C18:0). Subcutaneous fat is rich in fatty acids with a low melting point which tend to favour the increase in tissue water content (Molenat and Theriez, 1973). What this means to the consumer is yet to be determined, but the perception is growing that chevon is a low fat red meat, which is beneficial to human health.

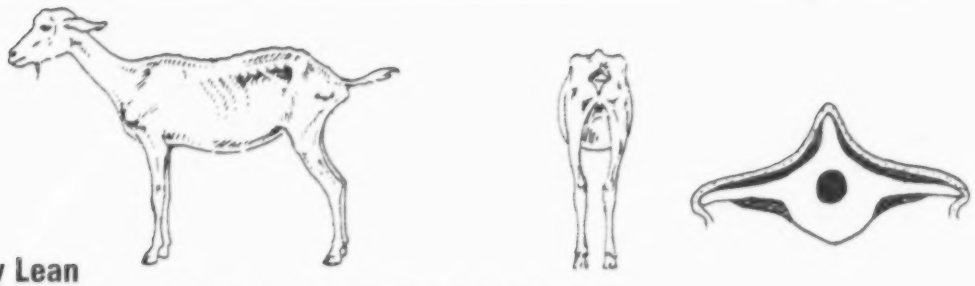
Carcass Quality

A goat carcass rarely has much subcutaneous fat to protect it from drying. Goat meat is generally quite lean although its higher moisture content makes it tender when handled properly. Poor chilling processes can toughen the lean meat of a goat carcass.

The dressing percentage obtained varies depending on the finish on the goat. Well-fleshed animals will dress out (head and feet removed, body cavity empty) as high as 52 per cent. Small, thin animals can yield as little as 34 per cent of the live weight in dressed carcass.

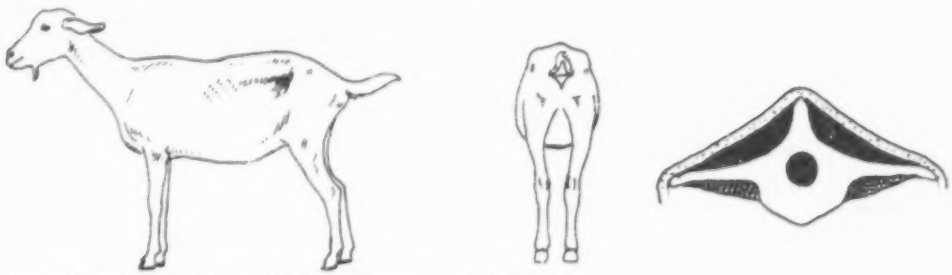
With goats, the condition score of the animal gives a rough estimate of the quality of the carcass. Very lean goats (Condition 1) will dress out poorly and the meat will tend to be tough. Goats scoring Condition 2 may have more meat covering the bones but little subcutaneous fat, while Condition 3 goats will be well fleshed with a thin subcutaneous fat layer. Goats in Condition 4 have a substantial fat layer under the skin, which means there is a lot of fat inside the body cavity around the kidneys, heart and in the pelvic area. Hips, short ribs, backbone and crops are covered with fat, and bones are barely discernible. These animals, when they appear in the meat market, are heavily discounted by most customers, who prefer goat meat to be lean.

Some goat carcasses are relatively lighter in the rear quarters and longer in the shank than the more typically "meaty" sheep carcass. The rib eye muscle is about half as deep as on sheep of a similar weight, and there is much less fat cover on the entire carcass.



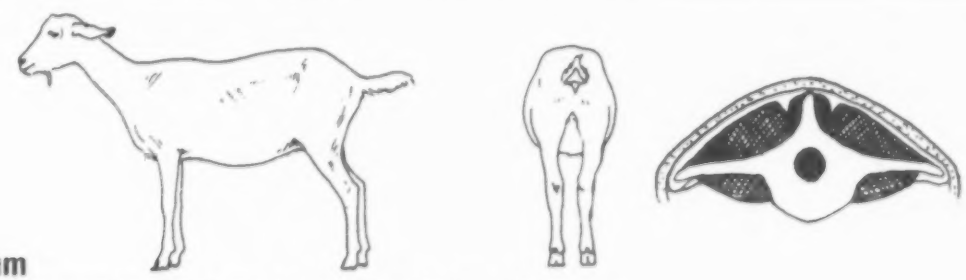
Very Lean

Body angular. Backbone raised and sharp. Ends of short ribs sharp and easily felt.



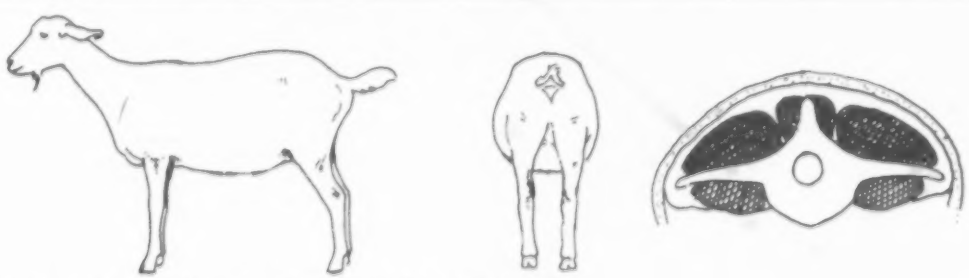
Lean

Backbone raised and barely covered. Pin and hip bones obvious and barely covered. Ends of short ribs smooth but easily felt.



Medium

Backbone slightly raised, smooth and rounded over top. Pin and hip bones lightly covered. Ends of short ribs smooth but can still be felt. Moderately rounded appearance.



Fat

Smooth, rounded appearance. Backbone can only just be felt. Pin and hip bones smooth and rounded. Ends of short ribs cannot be felt.

Condition scoring of goats

A Comparison of Carcass Yields

From Spanish Goats and Rambouillet Sheep

Trait	Goats Young Males	Sheep Young Males	Goats Aged Females	Sheep Aged Females
Live weight, lb	70.8	90.2	72.5	95.0
Carcass weight, lb	35.6	45.9	35.9	47.5
Dressing per cent (%)	51.7	50.8	49.5	49.9
Pelt (%)	11.8	12.2	9.8	9.7
% lean	64.4	57.7	57.7	52.7
% fat	13.5	21.4	19.5	29.2
% bone	22.1	21.3	22.8	18.1

From Hale, D.S. & Griffin, D.B, Texas A&M U. – Reported by Riley et al. 1989, Small Ruminant Res.

Wholesale Cut Composition

As a Proportion of Carcass Weight for Male Spanish Goats and Sheep

Trait	Goat	Lamb
Leg (%)	32	32
Loin (%)	8	12
Rack (%)	8	14
Shoulder (%)	35	24
Shank (%)	7	4
Breast (%)	9	8
Kidney & pelvic fat (%)	1	3

From Hale, D.S. & Griffin, D.B, Texas A&M U. – Reported by Snowder (unpublished)

The following table illustrates the variability that exists between breeds of goat and within breeds fed to different weights.

Dissectible Lean, Fat and Bone Content

Of Goat Carcasses from Different Breed Types

Goat Breed	Carcass Weight (lb)	% Lean	% Fat	% Bone
West African Dwarf, wether	17.6	64.1	10.1	20.3
Alpine, intact male	17.6	67.3	5.1	24.4
	22.0	67.8	6.3	22.8
	28.6	68.6	7.1	21.9
Boer, intact male	26.4	68.1	17.8	13.8
	27.5	64.5	21.8	12.6
	48.5	63.3	24.1	12.0
Saanen, intact male	11.0	60.9	9.9	25.6
	44.1	60.1	14.0	21.5
Saanen, female	22.0	61.8	10.6	24.7
	44.1	55.1	22.0	17.4

Warmington & Kirton (1990), Small Ruminant Res.

Male goats were found by Warmington and Kirton to be the leanest of carcasses examined, with the lowest per cent fat (7.4 per cent), followed by castrates (11.0 per cent) and female goats (13.0 per cent). The loin and leg cuts from the female were significantly more tender (as determined by Warner-Bratzler Shear test) than those from castrated and intact male goats. Differences between leg and loin cuts from intact male and castrates were not significant, but the meat from male carcasses tended to be the toughest of the three gender classes.

Butchering Goats

Among the difficulties experienced when marketing goats are the many traditional ways of butchering and cutting the animals.

Some customers prefer the skin left on, which prevents loss of moisture in the carcass to some extent. Hair may be scraped or burned off to make an edible skin product. Many customers like to obtain stomach, lungs, head, feet and other parts usually considered "offal"; if the inspector at the abattoir approves, these parts may also be packaged for sale.

If goats are to be sold into Muslim or Jewish communities, they will have to be slaughtered in a special way at an approved plant. Be sure your customers are happy with the slaughtering arrangements, or allow them to locate their own.

For general markets, split carcasses are usually acceptable; the customer may make his own cuts or have the carcass cut by a butcher.

Marketing Goats and Chevon

It is an offence to sell meat you have butchered yourself, or to allow other people to butcher animals on your farm. Offenders face a fine of up to $10,000 and/or imprisonment. With a large number of animals to sell, you should plan on having legitimate markets.

Meat butchered at a licensed abattoir in the presence of a provincial inspector may be sold in retail outlets. Fresh meat is preferred by many retailers, but frozen meat may be acceptable. If meat is to be shipped across provincial boundaries, federal inspection is required. Live animals may be transported, but livestock manifests and permits are required. Animals in transit must be off-loaded, fed and rested at regular intervals.

On this continent, markets for goat meat have never been as orderly or organized as they are for beef, poultry and pork. Chevon (goat meat) producers are on their own when marketing animals, which means a large proportion of meat goats turn up at the auction markets. The auction is accessible to all producers, who may deliver any number of animals whenever they wish, in the hopes that major buyers will be there and be willing to pay good prices for goats. Goats in good condition generally bring better prices than thin or overfat animals, but this is only relative and, at times, the animals may sell for less than the cost of production.

If one wishes to locate one's own markets, ethnic populations in large cities are traditionally the target to reach. Cultural organizations, specialty food stores and restaurants may be willing to buy bulk quantities of chevon, if they receive the stipulated quality of animal, processed in the manner they prefer.

Christmas and Easter sales of very young kids bring high prices per unit weight, but many producers prefer to sell the larger animals for a greater total price. The latter market also makes better use of the milk-producing potential of the doe. Selling unweaned kids means at least some does need to be milked, which can be a challenge if the does are not trained to stand for milking. Another benefit is that kids are available for brush clearing in the summer, if that is an objective of the producer.

Major population centres offer a producer higher prices for their product. However, transporting live animals for a long distance may result in shrinkage mainly due to loss of gut fill during fasting periods. It is estimated goats may lose from 3 to 5 per cent of their pre-shipping weight for every 24 hours without feed or water. Very young milk-fed kids may die from dehydration if they are not shipped and slaughtered quickly as possible.

A producer may sell live goats to a broker or other middle-person, who will expect to make something for his efforts at finding markets for the goats, and/or for having them butchered, packaged and placed in stores. Although the price the producer receives under this system may be less, it may be worthwhile to avoid the work and problems of marketing.

One system that has been suggested is the formation of producer groups, each group linked to a processor who would market the meat. The processor would require a sound marketing arrangement with guaranteed deliveries of animals of specified quality at specified times. The agreement would possibly involve the placement of outstanding seed stock with producers in order to improve carcass quality, and a high enough producer price to encourage production.

Co-operation among producers wishing to market their animals would likely lead to increased sales and greater confidence by customers. While the current free-for-all marketplace has led to surges and ebbs in the supply of goat meat, an organized approach involving many producers should be able to even out the supply and maintain the interest of retail outlets.

Meat Herd Management Calendar

This calendar provides guidance for meat goat production with the following assumptions:

- does and kids are on pasture from mid-May until mid-October
- all does are bred in November and kid in April
- all goats are fed a diet of hay and grain during the winter

Make adjustments to this calendar to accommodate other feeding systems and breeding schedules.

June	July	August
Feeding All does and kids should be on browse/pasture. Goats can be encouraged with or without a small grain feeding to return to a central night yard, where salt/mineral mix is available free choice. If bucks are not on pasture, feed palatable hay (11 - 12% protein) and provide plenty of fresh, clean water.	Continue.	Continue.
Breeding Check to see that all wether kids have been successfully castrated.	By July 15, remove un-castrated buck kids to be used for breeding.	Check to make sure that all wether kids have been successfully castrated.
Health Continue to use coccidiostat-medicated salt/mineral at least for kids. May be presented free choice in a creep area. If so, the does' non-medicated salt/mineral mix should be out of reach of kids.	Vaccinate kids by the end of this month for clostridial diseases and caseous lymphadenitis, abscesses (cheesy gland), starting at 8 weeks of age. Example: 7 or 8-way (most 8-way vaccines require 5 ml dose with the exception of Tasvax ®) plus CL vaccine.	Booster kids for clostridials and caseous lymphadenitis four weeks after the first vaccination. May be done in conjunction with mature stock booster shots early September.
Management Protect goats from severe conditions (e.g. rain, sun on hot afternoons). In case weather turns very wet, locate night pens on high ground to avoid standing water. Observe herd regularly; remove any goats showing abscesses.	Observe herd regularly. Weigh kids for 100-day weights May be done between 70 - 120 days of age.	Observe herd regularly. Trim feet.

September	October	November
Feeding		
Sample and analyze feed available. May start to supplement diet with low levels of vitamin A, as forage becomes more coarse and dry. Assure salt/mineral mix is adequate for nutrition and in good supply. If possible, start feeding small quantities of grain to does on pasture. If goats begin to lose condition due to deteriorating pasture, offer supplemental hay.	Flush breeding bucks and does before breeding; feed small amounts of grain to start (about 1/4 lb or 100 grams per head daily) and increase slowly (about 100 grams per head per week) up to 1 pound (400 - 450 grams per head) per day by start of breeding. Offer good quality, palatable hay free choice to all goats coming off pasture. Feeder stock: may be fed with does if fast weight gains are desired. If they are to be held for several months, they may be separated and fed little or no grain.	Maintain grain feeding to breeding stock throughout November, for the full breeding period. Make especially certain that bucks have plenty of fresh water. Encourage bucks if possible to eat good quantities of high-quality legume hay. Feeders: separate and feed for required gains.
Breeding		
Keep bucks separated from does, out of sight, smell and hearing if possible. Check bucks for breeding soundness. Scrotal circumference should be at least 23 cm.	When does return to farm in October, place them within sight and smell of bucks, but take care no bucks gets access to does. This will help to synchronize the does' breeding cycle.	Breed does. All does should be cycling. Remove feeder stock before releasing bucks. If you are attempting to identify superior bloodlines, pen each buck with his own group of does. One buck should easily service 50 does. If you cannot break the herd into smaller groups, run 2-3 bucks per hundred does in the big pen. Bucks can be run in two 12-hour shifts to give each shift some rest. Remove bucks November 30 if you do not want kids dropping after the end of April.
Health		
Check animals for problems before bringing off pasture. Isolate and treat or cull animals with health problems. Fecal test bucks. Worm bucks with an appropriate dewormer, as recommended by veterinarian. Booster all mature animals for clostridials and caseous lymphadenitis, abscesses (cheesy gland).	To control coccidia, feed medicated salt or treat herd immediately upon return to yards. On the basis of fecal tests, deworm does as or just before they return to winter yards. Check for lice; dip if necessary. If you prefer to dust, use three times at 17-day intervals.	Prevent urinary calculi in bucks. Do not feed too much grain to bucks; feed top quality legume hay frequently. Always provide good quantities of fresh water to bucks. If this is a problem in your herd, see your veterinarian about preventative medicine. Coccidiostat medicated salt is not usually necessary during winter for kids over six months of age.
Management		
Clean barns and corrals prior to restocking. Allow time for ground to dry, in sunshine if possible. Use hydrated lime to accelerate drying and to sanitize. Repair feeders and watering facilities, gates, building, yard fences, etc. Build divider panels. Ensure dry storage for feed and bedding. Start trimming feet.	Have all feet trimmed before bringing stock back to the farm. Make sure all breeding stock is identified; ears tags, tattoos, etc. It is best if I.D. can be read at a distance. Use ear tags in addition to tattoos if necessary. Weigh animals and record weights and condition score for each animal.	A marking harness worn by the dominant buck in the pen will help you spot does that may not be cycling and make it possible to record most breeding dates. Change marker colour after three weeks to help identify does returning in heat.

December	January	February
Feeding		
Feed bucks to regain condition. Bring bucks back into good condition before cutting back on their grain. After the middle of the month, feed mature breeding does for maintenance only; thin does and yearlings should continue to receive some grain throughout entire pregnancy. Salt/mineral mix: free choice, in loose form, in protected dry feeders. This mixture may carry additional vitamin A as recommended by veterinarian or nutritionist.	Continue on maintenance for goats in good condition (condition 2.0 +). Feed extra energy to thin or small young does. Encourage bucks to regain condition. They should be back to condition 2 - 2.5 before grain is discontinued. Thereafter, good quality part-legume hay will satisfy maintenance requirements for energy and protein. Feed adequate salt, minerals, trace minerals and vitamins to all goats. Markets for good young meat goats (36 - 70 kg, milk teeth, condition 2.5 +) may be good now. Avoid over conditioning, but try to attain maximum muscling.	Continue on maintenance for goats in good condition.
Breeding		
Separate bucks from does, out of sight, smell and hearing if possible. Provide bucks with dry, deep bedding throughout winter to prevent freezing of testicles. Note which does return to heat. A few does may return to heat even if conception has occurred. Breed if you wish but be prepared for late kids; kids will be too young to go on pasture with the rest of the herd.	Cull as many non-breeding does as can be positively identified. Try not to over-condition these animals if supplying a meat market. Evaluate feeders for their sires' relative genetic merit. Compare weaning weights, carcass conformation, days to desired market weight. R.O.P program is recommended.	
Health		
Check for lice; louse populations build rapidly at this time. Be aware of major types of lice likely to be found. Signs: licked patches in coats, thinning hair. Treat for lice if necessary; dip if weather permits. Rotenone powder effective if used three times at 17-day intervals. Consult a veterinarian about pour-on insecticides.	Maintain lookout for lice. Watch also for respiratory disease, pink eye and ringworm. Dry shelter and adequate nutrition, especially vitamin A, will prevent most of these problems.	If new does are added to the herd, be sure they have been isolated for at least a month before mixing with the home herd. Watch for abscesses or other illness, and meanwhile vaccinate with clostridial and caseous lymphadenitis bacterins. Delouse and deworm new additions thoroughly before putting them with herd.
Management		
Keep animals' housing dry. If using a deep manure pack, add straw when top layers become damp. Ensure adequate ventilation in barns. Smaller animals may need to be separated from the main herd, in pens where they may rest and eat in relative peace.	Keep all goats well-bedded and dry during the cold weather., especially if there is a significant wind chill.	Isolate and treat any illness as soon as it is noticed. Check animals more frequently in cold weather.

March	April	May
Feeding		
Feed higher energy as kidding approaches. Start off with low levels of grain feeding (100 grams per head per day) and work up gradually over 3 - 4 weeks to 400 - 500 grams per head per day by kidding, fed in two portions daily. Be especially certain that supplies of minerals and vitamins A and D are adequate and being eaten. In case of doubt, injections of A-D-E and selenium-vitamin E may be necessary. If so, try to have these shots administered by two weeks before kidding.	Continue to increase grain gradually for does nursing kids. Providing a creep area for kids may be beneficial. Offer highest quality feed in this area, and be very sure no does have access. Check condition of bucks. If in condition 2.0 - 2.5, grain may be discontinued; good hay can be fed to appetite, along with recommended salt/mineral mix. If bucks do not go on pasture, continue to feed vitamin A.	Does can be put on pasture as soon as desired growth is observed. If brush control is required, the earlier the better. Some supplementary hay and/or grain may be provided until transition is complete, especially if weather is cool or damp. Keep salt/mineral mix available free choice to goats on pasture or in night pens.
Breeding		
Feed bucks to regain condition. Keep well bedded and dry. Watch for abortions. If more than 3% occur, consult your veterinarian. Find and remove any birth fluids or materials in bedding of common pens. Isolate aborting does until discharge stops.	Does kidding. Attend all kiddings if possible. Note difficult births, retained placenta, and other kidding complications.	Cull non-breeding does unless you have a good reason not to (e.g. if there is a correctible cause of infertility and you are willing to correct it). Look at size (may have been too small to breed), kidding history, problems, etc.
Health		
Watch carefully for does off feed or in any way reluctant to eat, especially thin or very fat does. Treat all suspicious cases with propylene glycol. Start feeding coccidiostat-medicated salt/mineral to does one month before kidding to suppress oocysts being shed by does.	Routine deworming at or just before kidding time is most beneficial. Consult your veterinarian about type of dewormer to use. Dip navels of all kids in astringent/antiseptic (e.g. 7% iodine) at birth. If recommended by veterinarian or nutritionist, inject kids with vitamin A-D-E and/or selenium. Observe kids and check those that do not play, that lie around listlessly or stand hunched, that cry or seem constantly hungry or are constantly attempting to eat. Treat as needed.	Fecal samples should be checked to see if dewormer has been effective. All animals to go on pasture should be relatively worm free just prior to move. Continue feeding coccidiostat-medicated salt/mineral mix to herd until leaving for pasture. May be continued on pasture in night pens especially if weather is wet. Alternatives: amprolium or sulfamethazine in water just prior to leaving for pasture. Consult your veterinarian.
Management		
Set up kidding pens if used. Keep bedding dry and clean in kidding area. Do not overcrowd does. Provide plenty of resting space, feeding space etc. Ensure plentiful water supplies to pregnant does.	Record each kidding. Note date, identity of the doe, number of kids in birth, complications, birth weights, etc. Permanently identify kids as soon as possible after birth. Keep kidding areas clean. Remove afterbirths promptly and burn or bury. Clean and re-bed kidding pens after each occupancy if possible, and keep communal areas for fresh does clean and dry. See that all kids are suckling and doe's milk is flowing freely. Watch for hungry kids and adopt out to does with singles by following recommended steps. Disbud and elastrate kids within seven days of birth.	Trim feet of all animals before going on pasture. Weigh kids for 50-day weight on R.O.P. program. May be done between 28 and 69 days of age.

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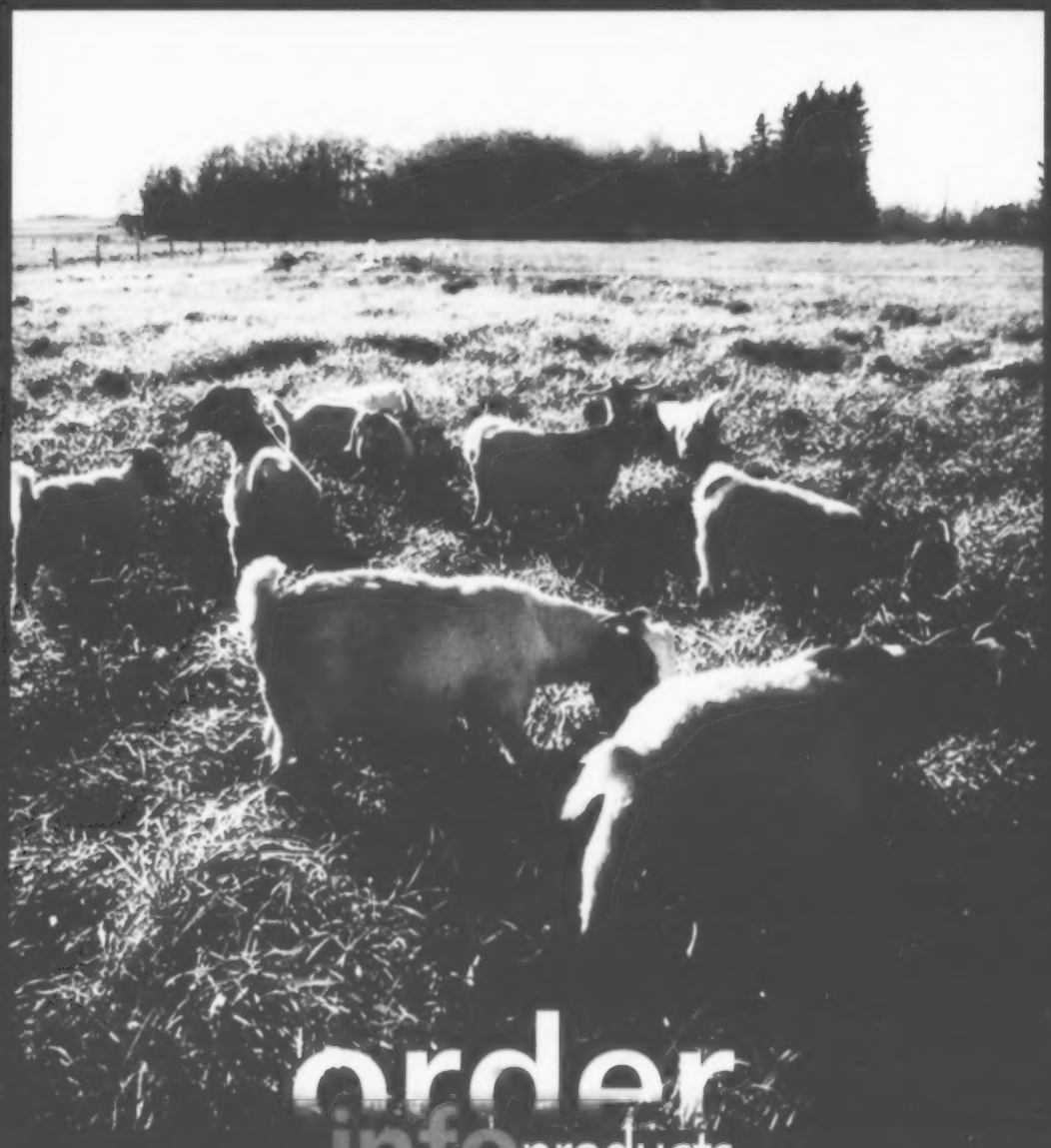

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